BROOKLYN BOTANIC GARDEN

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EDITED BY

C. STUART GAGER

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THE BROOKLYN INSTITUTE OF ARTS AND SCIENCES

BROOKLYN BOTANIC GARDEN RECORD

VOL. VI January, 1917 No. 1

PROSPECTUS OF COURSES OFFERED BY THE BROOKLYN BOTANIC GARDEN, 1917

A. CHILDREN'S GARDENS AND NATURE STUDY

Courses for Children

A1. Garden Practice.—A course in outdoor work, open only to those pupils who are recommended by their teachers for excellence in nature study in their schools. The work includes the raising of common vegetables, flowers, and fiber plants. Open to a limited number of both boys and girls. A *fee of twenty cents* will be charged, the material raised becoming the property of the pupil. Twelve lessons every *Saturday* morning, 10:30–11:30, from *April 14–June 30.* Miss Shaw, Miss Cross.

A2. Summer Garden Work.—A summer's work in the garden, each child having his own plot. A *fee of twenty cents* a month will be charged for material consumed except to those continuing from Course A1, who will be charged *ten cents.* Each child has the product from his own garden. *Saturday* mornings, 9–11, *July 7–September 22.* Miss Shaw, Miss Cross.

A3. Nature Study.—The structure and germination of seeds; the parts of a plant and their uses; relation of the plant to soil, air, water, and light. The course consists of study of the plants themselves, with experiments and greenhouse work done by the

children. Open to children from 8–12 years of age. A *fee of ten cents* will be charged to cover material used. A certificate will be given those who satisfactorily complete the course. Courses will be given, both spring and fall, as follows:

Boys' Spring Course.—*Saturday* mornings, 9–10, from *January 20–February 24.*

Girls' Spring Course.—*Saturday* mornings, 10–11, from *January 20–February 24.*

Boys' Fall Course.—*Saturday* mornings, *9–10,* from *October 6–November 10.*

Girls' Fall Course.—*Saturday* mornings, 10–11, from *October 6–November 10.* Miss Shaw, Miss Cross.

A4. Plant Propagation.—Raising of plants from seeds for the outdoor vegetable and flower garden; elementary study of soils. Work done in the children's greenhouse. *Fee,* for material used, *fifteen cents.* Girls and boys from 12 to 15 years of age are eligible to these courses. Two of these courses will be offered each spring and two each fall, as follows:

Girls' Spring Course.—*Saturdays,* 10–11, *March 3–April 7.*

Boys' Spring Course.—*Saturdays,* 9–10, *March 3–April 7.*

Girls' Fall Course.—*Saturdays,* 10–11, *November 17–December 22.*

Boys' Fall Course.—*Saturdays,* 9–10, *November 17–December 22.* Miss Shaw, Miss Cross.

A5. Advanced Nature Study.—A course designed for those older boys and girls who have taken courses *A1–A4.* Plant collections will be made, and the simpler principles of classification studied. Special problems will be assigned to individuals, and larger garden plots will be set aside for the further working out of these problems. *Open only to pupil assistants of the Garden.* For details confer with Miss Shaw.

Girls' Spring Course.—*Saturdays,* 1–2, *February 3–April 7.*

Boys' Spring Course.—*Saturdays,* 2–3, *February 3–April 7.*

Girls' Fall Course.—*Saturdays,* 1–2, *October 6–November 24.*

Boys' Fall Course.—*Saturdays,* 2–3, *October 6–November 24.*

Miss Shaw, Dr. Gundersen, Mr. Stoll.

A6. Junior Gardener's Course.—A course for boys from 14–17 years of age. Lessons given in the care of border and other flower beds, in the weeding and care of small vegetable gardens, in mowing and watering lawns, reporting plants, etc. This is planned to fit boys for summer work and to enable them to obtain positions. Hours to be arranged. *Fee twenty cents.* Practical work with the gardeners and foreman, under Miss Shaw's supervision. *Not offered in 1917.*

A7. Nature Study for Boy Scouts, Camp Fire Girls, and Others.—Short courses of at least four hours each, with talks, demonstrations, and field trips in the Botanic Garden and Prospect Park to study trees, shrubs, etc. The instruction will be adapted to meet the needs of the various groups who apply. *Open only to groups of at least six persons,* at hours to be arranged.
Mr. Stoll.

Courses for Teachers

A8. Greenhouse Work for Teachers.—This course is planned to be of assistance to teachers in garden work with children. A study of soils, and of the plant itself. Practical work in the propagation of plants, and the raising of flower and vegetable seedlings for the outdoor garden. A *fee of fifty cents* will be charged to cover cost of materials. *Tuesday* afternoons, from 4–5, *February 20–March 27.* Miss Shaw.

A9. Nature Study for Teachers.—Intended to familiarize teachers with material suitable for class use and with easily accessible sources. The work given will be practical, such as may be applied in the Nature Study teaching of the class room. A *fee of fifty cents* will be charged to cover cost of material. *Mondays,* from 4–5. *March 26–June 4.* Miss Cross.

A10. Fall Garden Work.—Home plants; the school window box; indoor planting of bulbs; the outdoor bulb bed. A *fee of fifty cents* will be charged to cover cost of materials. Five *Tuesday* afternoons, from 4–5, *October 2–30.* Miss Shaw.

A11. Fall Nature Study Work.—The emphasis in this course will be placed on the common nature material and its use in the

class room. A *fee of fifty cents* will be charged. *Mondays* at 4, from *October 1–November 19.* Miss Cross.

Lectures for Children

(Admission only by Ticket)

Stories About Useful Plants. (Illustrated.)

March 3. Rice, the food of a billion people.
" 10. Beverage plants; tea, coffee and cocoa.
" 17. How plants live and grow.
" 24. How to make a garden.
" 31. Early spring wild flowers.

These talks will be given in the new lecture hall, and will be illustrated by lantern views. Tickets will be issued in the order of application until the number is exhausted.

The talks will be repeated for school classes, if so desired, either at the Garden or at schools.

B I. Courses for Teachers of Children's Gardening

There is an increasing demand for persons adequately prepared to become teachers or supervisors of children's gardens, but opportunities to secure the necessary preparation are not numerous. As in other cases where special problems are to be met and solved, an interest in children, a mere liking for the work, or even native teaching ability, while highly essential, are not, of themselves, sufficient to insure success.

The following ten courses are planned to acquaint the prospective teacher with some of the main problems to be met with in this work, and such effective solutions of them as have been worked out in practice. *The ten courses are considered as a unit, and are not offered separately.* Whenever possible it is urged that the entire course be completed within two school years. Special importance is attached to No. *B II.*

The *fee for the entire course is Fifteen Dollars.* In case credit is given for work done elsewhere, the minimum charge for a certificate will be Ten Dollars.

To those who satisfactorily complete the work a *Certificate in Children's Gardening* will be granted.

B1. Soils and Agricultural Principles.—A study of soils; fertilizers, natural and chemical; relation of water and air to soil; liming; mixing of soils and tillage. Five lectures with laboratory work. *Tuesday* afternoons, from 4–5, *January 16–February 13.*
Miss Shaw.

B2. Elementary Botany.—A survey of general physiological and morphological principles, illustrated by a few of the more important types of plants. Sixteen lectures and demonstrations in laboratory, greenhouse and garden. *Mondays* at 4 p. m., *January 15–April 30.* Dr. Olive, Dr. Gundersen.

B3. Children's Garden Practice.—Practice work with a class of children; including such topics as planning and making the garden, laying out of grounds, preparation of soil, seed sowing, transplanting, cropping, cultivation, school garden management, improvement of school grounds, preparation of exhibits. Twenty lectures and outdoor practice work. *Saturday* mornings, 10–11:30, *February 10–June 23.* Miss Shaw, Miss Cross.

B4. Plant Propagation and Greenhouse Work.—Methods of plant propagation, care of plants, cuttings, raising of seedlings for the outdoor garden. Work related to children's gardens. Laboratory work. Eight *Wednesdays,* 3:30–5 p. m., *February 7–April 18.* Miss Shaw, Miss Cross.

B5. Nature Study.—Nature in relation to gardens and plant life. Topics: plant structure; fruit and fruit formation; weeds; weed dispersal; insect pests; birds in their relation to agriculture; garden friends; shrubs; shade and lawn trees. Twenty lectures. *Tuesdays,* 4–5 p. m., *February 20–May 8* and *September 18–November 6.* Miss Cross.

B6. Fungous and Insect Pests.—Four lectures and demonstrations on the occurrence of, and methods of combating the common fungous and insect pests of garden and greenhouse plants. *Mondays* at 4 p. m., *May 7–May 28.* Dr. Olive, Mr. Free.

B7. Fall Garden Work.—Practical work with the outdoor bulb bed, harvesting of garden crops, indoor planting of bulbs, raising

of plants indoors, the window box. Five lessons on *Wednesday* afternoons, from 4–5, *October 3–October 31.* Miss Shaw.

B8. Pedagogy of Botany.—A brief discussion of the mental processes involved in learning and teaching science, and the fundamental principles which underlie and point the way to laboratory and field work. Three successive *Wednesday* afternoons, from 4–5, *November 7–November 21.* Dr. Gager.

B9. Genetics.—Four lectures on the problems of heredity, variation and environment, and their bearing on education; illustrated by demonstration material obtained from plant-breeding experiments, and by lantern slides. Lecture subjects: Kinds and extent of variation in plants and animals; How characters are inherited; Sex in plants and the methods of crossing; Human heredity. *Tuesdays,* from 4–5, *November 13–December 4.* Dr. White.

B10. Woodwork.—The construction of simple garden apparatus, such as window boxes, flats, sieves, tampers, pricking sticks, etc. *Saturdays,* 10–12, *September 22–October 27.* Mr. Stoll.

B11. Practical Garden Work.—A summer's work with children in the Botanic Garden under supervision.

B II. Summer School of Children's Gardening

Courses *B1–B11* are also offered as a concentrated six-weeks' summer course, from *July 5* to *August 16, 1917.* For circular and further information apply to Miss Ellen Eddy Shaw.

C. Courses for the General Public

C1. House Plants and Small Conservatories.—Five lectures with demonstrations and practical work. The course includes consideration of principles to be observed in the care of indoor plants, and cultural details concerning suitable subjects. Instruction will be given with reference to hanging baskets, window boxes, Wardian cases, etc. A *fee of $2.50* will be charged to cover cost of materials used. The plants raised by the class will become the

property of those taking the course. *Thursday* at 4, *January 18–February 15.* Mr. Free.

C2. Garden Planning.—Three lectures with practical demonstrations. The object of this course is to help owners of small places to plan their yards and gardens to best advantage. *Thursdays* at 4, *March 1–March 15.* Mr. Free.

C3. The Outdoor Flower Garden.—Ten lectures with demonstrations and practical work. Instruction will be given with regard to soils, preparation of grounds for planting, propagation, hardy perennials, annuals, vines, herbaceous borders, summer bedding, shrubbery, roses, making and care of lawns, drainage, etc. A *fee of $1.00* will be charged to cover cost of materials used. *Thursdays* at 4, *March 22–May 24.* Mr. Free.

C4. Garden and Greenhouse Work in Fall.—A course of six lessons covering the making of cuttings, taking up and storing of plants, bulb planting, winter protection of plants, fall pruning, etc. *Thursday afternoons* from 4–5, *September 27–November 1.* A *fee of $1.00* will be charged to cover cost of material used.
Mr. Free.

C5. Spring Flowers and Ferns.—Largely an outdoor course, with some excursions. Twelve *Saturdays,* at 3:30, from *March 31–June 16.* Dr. Gundersen.

C6. Fall Course in Trees and Shrubs.—Most of the time will be given to outdoor study in the Botanic Garden and adjacent Prospect Park. Twelve Saturdays, at 3:30, from *September 22–December 8.* Dr. Gundersen.

C7. History of Botany.—Six lectures giving a brief outline of the history of botany from the time of the Greeks to the present. *Saturdays,* at 3:30 o'clock, *January 27–March 3.*
Dr. Gundersen.

C8. Bacteria and Other Micro-organisms in the Home.—Eight periods devoted to lectures and demonstrations on the occurrence of bacteria, yeasts, molds and other micro-organisms in the home;

in water, sewage, etc. *Saturdays,* at 11:00, *February 3–March 24.* Dr. Olive.

C9. Heredity and Environment.—Five lectures, planned *especially* for teachers, preachers, and social workers. Special emphasis will be laid upon the part played by heredity and environment in the formation of human character, both physical and mental. Illustrations of fundamental truths, applicable to classroom and social problems, presented in the form of charts, diagrams, lantern slides, and demonstration material from breeding experiments. Persons who contemplate taking this course should first consult with Dr. O. E. White, either personally or by mail. *Saturdays,* at 10 a. m., *November 3–December 1.* Dr. White.

N.B. Courses *C1–C9* inclusive, are open free to the public unless otherwise specified. Those planning to take any of these courses are asked to register at the Garden at least one week before the course opens, so that adequate arrangements may be made for materials, etc. They are open to both men and women, *but no course will be given to a class of less than six.*

D. Advanced Courses and Investigation

For the following advanced and research courses there is a charge covering all expenses, including laboratory fee, of *$30 for each full course* of 100 credit hours, and *$20 for each half course* of 50 credit hours.

Advanced Courses

D1. Mycology and Plant Pathology.—Morphology and pathology of the fungi and bacteria. Life histories of fungi; methods of control of plant diseases, etc. Prerequisite, a satisfactory college course in general botany. 100 credit hours of work. Hours to be arranged. Dr. Olive and assistant.

D2. Fresh-water Microbiology.—A course of lectures, recitations, and laboratory work on the various organisms found in drinking water. Odors, colors, etc., of drinking water; methods of microscopical and bacteriological examination. 50 credit hours of work. Hours to be arranged. Dr. Olive and assistant

D3. Cytology.—A course of lectures and laboratory work on cell structure and physiology. Methods of cytological technique, and practice in accurate interpretation of cell phenomena. Prerequisite, satisfactory college courses in general botany and plant physiology. 100 credit hours of work. Hours to be arranged.
Dr. Olive and assistant.

D4. Experimental Evolution.—Detailed studies of the nature and causes of variation and heredity. Some of the subjects considered are: Historical Resumé of the Evolution Theory, Physical Basis of Inheritance, Inheritance of Acquired Characters, Kinds and Causes of Variation, Mendelism, Biometry, Principles and Technique of Plant Breeding. This course is open to students of college rank with a knowledge of the elements of physics, chemistry, geology, botany, and zoology. The work is primarily intended for students in pure science, and for agricultural or horticultural students fitting themselves for various professional activities in these particular fields. Three lectures and two laboratory periods a week. 100 credit hours of work. Hours to be arranged.
Dr. White.

D5. Phytogeography.—A course dealing with plant distribution over the earth. Prerequisites are courses in plant ecology and geology, and a good general knowledge of climatology and systematic botany. 50 credit hours of work. Hours to be arranged.
Mr. Taylor.

D6. Seminar and Journal Club.—A bi-weekly meeting of the Garden Staff and advanced students, for the discussion of fundamental problems of botany or of general biology, and for the review of pertinent botanical literature. Open to others on invitation.

*Graduate Study and Botanical Research**

D7. Research in Plant Physiology.—Independent investigation of problems dealing with plant functions. Thesis. Dr. Gager.

*Courses of graduate rank offered by the Botanic Garden, when approved by the Faculty of the Graduate School of New York University, are listed as courses in the Graduate School, and are given the same credit as other graduate courses. Properly qualified students who take these courses may present them in satisfaction of the requirements for advanced degrees given by the University. Graduate credit has also been allowed elsewhere for such advanced work done at the Garden.

D8. Research in Mycology and Plant Pathology.—Independent investigation of problems in fungi and fungous diseases of plants.
Dr. Olive.

D9. Research in Plant Genetics.—Independent investigation of problems of variation and heredity, including that phase of cytology having a direct bearing on the subject matter of genetics.
Dr. White.

Cooperation With Local Schools

1. Talks at Schools.—The principals of public or private schools may arrange to have lantern talks given at the schools on various topics related to nature study, such as garden work with children, tree planting, and Arbor Day. If an illustrated lecture is desired, the lantern and operator must be provided by the school, but slides will be furnished by the Botanic Garden. Address the Curator of Elementary Instruction for list of talks and for appointments.

2. School Classes at the Garden.—(*a*) Schools not provided with a stereopticon may arrange for their classes, accompanied by their teachers, to come to the Botanic Garden, for lectures either by a teacher, or by a member of the Garden staff.

(*b*) Notice of such a vist should be sent at least two days previous to the date on which a talk is desired. These talks will be illustrated by lantern slides, and by the conservatory collection of useful plants from the tropics and subtropics. Spring and fall announcements of topics will be issued during 1917.

(*c*) The Garden equipment, including greenhouse, plant material, lecture room, lantern, and slides, is at the disposal of teachers who desire to instruct their own classes at the Garden. Arrangements must be made in advance with the Curator of Elementary Instruction, so that such work will not conflict with regular classes and lectures.

(*d*) The principal of any secondary or high school in Brooklyn may arrange also for a series of six lessons on plant culture to be given during the fall to a class. These lessons will be worked out for the most part in the greenhouse. Such a course must be arranged for in advance, and the class must be accompanied by its teacher. Adapted for pupils above the fourth grade.

3. Home Gardening.—Assistance will be given to children in planning and planting home gardens. Enrollment cards for such assistance may be had on application to the Curator of Elementary Instruction. Prizes will be offered to both schools and individuals, at the annual Children's Garden Exhibit, for the best results in home gardening. This exhibit is open to all children in the City of Brooklyn, although their garden products may have been raised at their summer homes. *Certifications must be made that the work has been done by the child himself.*

The exhibit for 1917 will be held on the 14th and 15th of September. All exhibits, of schools as well as of individuals, must be brought to the Brooklyn Botanic Garden on the afternoon of September the 13th, or by 10 o'clock on the morning of the 14th. The exhibit will be judged on the afternoon of the 14th, and will then be on exhibition for the public from three to five o'clock on the afternoon of the 14th, and from ten in the morning until four in the afternoon of the 15th. The announcement of prizes will be made on the 15th. After four o'clock of this day, exhibitors may remove their exhibits. Prizes will be distributed on Saturday afternoon, September 29, at three o'clock.

Silver and bronze medals will be awarded as first and second prizes for individual exhibits. A trophy is the first prize for the school making the best exhibit as a whole. This prize is to be competed for annually until one school wins it three times, when it will become the property of that school. A new prize will then be offered. P. S. 152 won last year, for the third time, the statue of Victory, our first trophy. The second prize is a silver cup, which is retained by the winning school.

4. Penny Packets of Seeds.—In order to assist the above work, penny packets of seeds are put up by the Botanic Garden, for children's use. In the early spring, lists of these seeds, conditions for entry as an exhibitor, home gardening record cards, and other information may be had on application to the Curator of Elementary Instruction.

5. Conferences.—Conferences may be arranged by teachers and principals for the discussion of problems in connection with gar-

dening and nature-study. Monday and Saturday afternoons are usually available for this purpose. Appointments must be made in advance. Address Miss Ellen Eddy Shaw.

6. Study and Loan Material.—On request, the Garden will endeavor to provide living seedlings or plant parts for study, to the extent of our facilities. Teachers may arrange to have various physiological experiments or demonstrations conducted at the Garden. Petri dishes, which must be cleaned and delivered to the Garden, will, on request, be filled with nutrient agar, ready for exposure in the study of bacteria and molds. In all cases arrangements must be made by teachers for calling for such material, and all material loaned by the Garden must be returned promptly in good condition.

Plantations

The plantations comprise several sections, including the local flora (native wild flower garden), general systematic (trees, shrubs and herbaceous plants not native within 100 miles of Brooklyn), morphological, ecological, economic, and rock gardens, Japanese garden, and children's gardens. As noted below, under *Docentry,* arrangements may be made for viewing the plantations under guidance. They are open to the public free to the public daily from 8 a. m. until dark; on Sundays and holidays at 10 a. m.

Conservatories

The Garden conservatories contain a collection of tender and tropical plants. Of special interest for teachers of nature study and geography is the economic house, containing useful plants from the tropics and subtropics, including the following: banana, orange, lemon, lime, citron, kumquat, tangelo (a cross between the grape-fruit—pomelo—and the tangerine), West Indian cedar (the source of the wood used for cigar boxes), eucalyptus, Manila hemp, sisal, pandanus (source of the fiber used for making certain kinds of panama hats), fig, grape vines from north and south Africa, date palm, cocoanut palm, chocolate tree, coffee, tea, camphor, ginger, sugar cane, avocado (so-called "alligator

pear"), Para and other rubber plants, banyan, religious fig of India, and numerous others.

The conservatories are open daily from 10 a. m. to 4 p. m. In this connection see also below, under *Docentry*.

Herbarium

The Garden herbarium consists at present of over 100,000 specimens, including phanerogams, ferns, mosses, liverworts, lichens, parasitic and other fungi, algæ, and myxomycetes. This collection may be consulted from 9 a. m. until 5 p. m. by those interested, and specimens submitted will be gladly identified. Address Curator of Plants.

Library

The rapidly growing library of the Garden, comprises at present about 4,000 volumes and 6,000 pamphlets. This is not a circulating library, but is open free for consultation to all persons, from 9 a. m. until 5 p. m. Over 200 current periodicals devoted to botany and related subjects are regularly received.

Docentry

Classes, and other parties of several persons, wishing to view the conservatories and plantations under guidance, may arrange with the Curator of Public Instruction for appointments with a docent to conduct them through the Garden. For this service there is a charge of 25 cents an hour or fraction thereof, or 10 cents a person for parties of three or more; except that *no charge is made for teachers with classes, nor to members of the Botanic Garden.*

PHYTOPATHOLOGICAL SURVEY OF THE TREES AND SHRUBS OF PROSPECT PARK AND THE BOTANIC GARDEN (BROOKLYN). I. REPORT OF THE FIRST SEASON'S WORK.

DR. C. STUART GAGER, DIRECTOR.

Sir: I beg to submit herewith my report as Resident Investigator at the Brooklyn Botanic Garden for the summer of 1916. The report deals with the studies made on diseases of trees and shrubs in the Brooklyn Botanic Garden and Prospect Park, Brooklyn.

I entered upon the work June 19, and continued at the laboratory of the Botanic Garden until September 11, when it was necessary for me to return to my regular duties at the University of Missouri. During this period, numerous trips were made through Prospect Park and the Botanic Garden for the purpose of noting and collecting the various fungous diseases of the trees and shrubs.

I wish to acknowledge the lively interest of Mr. Raymond V. Ingersoll, Commissioner of Parks, Borough of Brooklyn, in this work, and his generous courtesy in placing men and equipment at my disposal, and in permitting the collection of specimens for study and preservation. I am especially indebted to Mr. J. J. Levison, then arboriculturist of the Park, for facilitating the survey of the diseased conditions in the Park. Mr. John J. Lennon, foreman of laborers, aided in every way possible in obtaining the material. At different times he kindly placed at my disposal some of his workmen, who assisted me in securing the various specimens from the trees.

In Prospect Park and the Botanic Garden, approximately sixty-five diseases of the woody plants were collected. Several collections of some of these diseases were made. In a few cases, the same disease was collected on different hosts so that the total number of collections runs considerably over one hundred.

In some cases, while diseased conditions were found on the trees or shrubs, no fruiting structures of parasitic fungi were secured. In such cases, collections were made repeatedly throughout the season in the hope that the fruiting stage of the

fungus might be obtained. In part, the failure to secure the fruiting structures of the parasite was due to the shortness of the collecting season. Many of the parasites develop their fruiting structures late in the fall or early in the spring. Accordingly, in order to secure these forms in their full development, a much longer collecting season than the summer months is necessary. It might further be noted that many fungi are conspicuous only early in the spring or late in the fall. Accordingly, in order to secure anything like a complete collection of the parasites growing on the woody plants in the Park and the Botanic Garden, the work should extend throughout the entire year. It is also certain that collections extending over a period of years would result in the discovery of additional interesting and economically important forms which might escape attention in a brief collecting period of one or two seasons.

Since my return to Columbia, I have attempted to further complete the identification of the forms collected. As yet, however, I have not succeeded in identifying all of the fungi. In this connection, I wish to acknowledge the services rendered by Dr. J. J. Davis, curator of the herbarium at the University of Wisconsin. Dr. Davis has kindly looked over some of the material and aided me in identifying properly various forms that were collected.

In addition to the collections made in Prospect Park and the Botanic Garden, several trips to points on Long Island and New Jersey were made, in company with Dr. E. W. Olive, of the Garden staff, and Prof. R. A. Harper, of Columbia University, and various fungi occurring on herbaceous plants were then secured, as well as those that were found on trees and shrubs. On these different trips, more than two hundred different collections of parasitic fungi were made. The collections include approximately one hundred and fifty different species of fungi. Many of those collected in Prospect Park and in the Botanic Garden were also secured on these trips.

Perhaps the most serious disease encountered was one which attacked the gray birches in the Botanic Garden. A large number of trees had already died and been removed from the grounds. Many others were conspicuous on account of the dead and dying

tops. Another striking phenomenon in connection with these trees was the unusual production of short shoots at the base of the diseased trees.

It is probable that the primary cause of the death of the birch trees is the bronze birch borer. All of the diseased trees were found infested with this insect, which has been reported as the cause of the destruction of a large number of birch trees, particularly in the parks. Associated with the birch borer, however, were various fungi which are probably secondary invaders of the dead or dying portions of the trees.

The fungus which was found to occur with great regularity on the small branches of the trees was *Cytospora horrida* Sacc. Numerous canker-like areas were found on many of the larger limbs, often adjacent to their attachment to the main stem. These cankers were regularly infested with the bronze birch borer. In addition, the imperfectly developed fruiting bodies of fungi were found on the cankers.

One tree of the European white birch in the Botanic Garden was found to have died and the main trunk and larger limbs were badly infected with *Melanconium bicolor* Nees. The fruiting bodies of the fungus had protruded through the bark over a large portion of the surface of the tree. The tree was about four inches in diameter and the main trunk and the larger branches, down to one inch in diameter, were extensively covered with the fruiting bodies. To some extent, the bronze birch borer had also infested this tree and again the insect may have been the primary cause of the death of the tree.

The leaf spot of the sycamore, *Gnomonia veneta* (Sacc. & Speg.) Kleb., was very common, both in the Park and in the Botanic Garden, during the latter part of June and the first part of July. During this time, a large portion of the leaves on the trees were infected and were constantly falling to the ground. A few individual trees were practically defoliated, although in some cases the damage was not nearly so severe. Due to the fact that the sycamore puts out additional leaves rather rapidly, the trees practically regained their normal appearance toward the end of the summer. While many oaks were found in both Park and Garden, this disease was not collected on any of them.

The disease, however, was collected on both sycamores and oaks in certain localities on Long Island. This fact suggests the close relation between the trees in the city parks and those of outlying districts on the Island, and shows the necessity of including in this study a much wider area than the city limits, especially in connection with plans for remedial measures and control.

The catalpa trees, particularly the large ones in Prospect Park, were very severely attacked by the catalpa leaf spot, *Phyllosticta catalpae* Ell. & Mart. Practically every leaf on the trees, about the middle of July, had a dozen or more distinctly infected areas. In some cases, the infected areas of the leaf were more extensive than the sound tissues. Such badly diseased leaves fell from the tree. For a short period, near the middle of July, every day or so the ground would be fairly covered with leaves that had fallen off. Again, however, due to the fact that the catalpa continues to put out new leaves during the growing season, the disease seemed to have practically disappeared by the first of September.

The rhododendrons were badly infected with a fungus which has not been certainly identified. The tips and margins of the leaves turned brown and fell from the bushes prematurely. A large proportion of the leaves of the plants were infected, resulting in a conspicuous defoliation of the shrubs.

The roses in the rose garden of the Park were infected with the common rose leaf spot, *Actinonema Rosae* (Lib.) Fr. Some of the varieties were much more severely attacked than others. In general, however, the attack was not so severe as to materially affect the appearance of the plants.

In the latter part of August, a leaf disease on some of the magnolias became conspicuous. Apparently the cause of the disease is *Phyllosticta cookei* Sacc.

Early in September the powdery mildew, *Microsphaera alni* (Wallr.) Salm., of the lilac was becoming very conspicuous. The fungus was in the conidial stage and was rapidly spreading over the leaves of the shrubs. Powdery mildews usually appear late in the season and additional forms on other hosts would certainly have been found if it had been possible to collect them later in September.

Relatively few fruiting bodies of the higher fungi, which cause

the decay of the wood, were collected. This was due, in part at least, to the fact that these structures are rather conspicuous and thus attract attention, so that individuals remove them from the trees. Further, the careful pruning operations carried out by the Park workmen naturally tend to the removal of these fungous structures before they have attained any appreciable size. However, many of the trees showed evidences of various decays due to the development of the mycelium of the various higher fungi. The decayed areas generally were associated with injuries to the trees. Where a limb had been broken off or the pruning operations improperly carried out, the fungi gained entrance and produced the decay of the underlying tissues.

Nevertheless, in several cases the fruiting structures of various polypores were collected. A well-grown specimen of *Fomes applanatus* (Pers.) Wallr. was collected at the base of a large privet plant. This shrub, like most of the other privets in the park, had been pruned back, leaving a large number of stubs a foot or more in length. From these stubs, the new leaf-bearing branches of the shrub had developed. The fruiting body of the *Fomes* was found close to the ground, growing from one of the larger stubs. This particular stub, however, was also producing branches bearing living green leaves.

One well-developed specimen of *Daedalea quercina* (L.) Pers. was found on the English oak. The fruiting body was located at a point on one of the large limbs where previously a smaller limb had been pruned off. Sufficient care had not been taken, however, to prevent the cut surface from exposure to fungus invasion. The *Daedalea* had doubtless gained entrance at the pruned surface, and by subsequent growth had produced decay back for a considerable distance. In fact, the decayed region extended back practically to the main trunk.

Several fully developed specimens of *Polyporus gilvus* Fr. were collected on the soft maple and on the blue beech or American hornbeam. The fruiting bodies covered a considerable area of the trunk of the maple several feet from the ground. In this case also the growth was associated with an injury due to the breaking off of a large limb. On the American hornbeam, the main stem was attacked and bore several fruiting bodies. The

tree, however, was still alive with fairly vigorous foliage branches.

The lilacs and the privets were badly infected with *Polystictus versicolor* (L.) Fr. Most of the larger shrubs of these plants had been cut back, leaving short stubs six inches to two feet or more in length, and from these new leafy branches had developed. It was noted that in a large percentage of the cases, these old stubs were badly attacked by *Polystictus versicolor*. The wood was badly decayed and the brackets of the fungus were very common. In many cases, a part of the wood had been decayed and bore the brackets, while the other side of the stem was still alive and bore long leafy branches. It is evident from the common occurrence of this fungus that it is a serious enemy of the older privet and lilac shrubs, and special precautions must be taken to prevent its development. Special care must be taken, when pruning the old shrubs back, so to treat the cut surfaces that the fungus may not gain entrance.

This same fungus was collected on other plants. One of the most striking cases was found on an English haw. This plant had branched close to the ground, and consisted of two main branches each about five inches in diameter at the base. They were about twelve to fifteen feet high. One branch was entirely dead. The wood was badly decayed and the surface quite covered with the brackets of *Polystictus versicolor*. The brackets extended from the ground to practically the tip of the branch. This branch had been injured some time previous. Through the injury the fungus had gained entrance and ultimately killed the entire branch.

A polypore was collected at the base of several large wild cherry trees in the Park. The structures, however, had not matured sufficiently to make an accurate determination. Several trees bore one or more of these imperfectly developed fruiting bodies which were associated with decay in the trunk of the trees.

Schizophyllum alneum Schr. was collected on dead branches of *Ailanthus* in the Botanic Garden and on sumac in the Park. It is probable, however, that these trees had died from other causes and that *Schizophyllum alneum* was a secondary development.

Pleurotus ostreatus Jacq., the oyster mushroom, was collected on the sugar maple. In this case also, the fruiting bodies were associated with large wounds, the result of the breaking off of branches.

A species of *Stereum* was collected on the English oak and also on the black birch.

A number of serious troubles were observed to which, at present, no cause can be assigned. The foliage of the beech trees showed a large proportion of the leaves with conspicuous dead and dying areas. The same is true of the foliage of the sugar maples and the varnish tree. While collections of these leaves were made throughout the season, no specific fungus was found which might be responsible for the characteristic effects. In fact, it is probable that these foliage injuries were due to some environmental condition. It remains to be determined just what condition is connected with these conspicuous foliage injuries.

Many of the pines, particularly the white pine, showed a large number of dead needles as well as dead and dying branches. In general, the Austrian pine was quite free from any such symptoms. In the Garden, however, one or two trees were located which showed a conspicuous dying of many of the branches. Again, no specific fungi were found which might be regarded as the cause of these troubles.

The condition of the trees and shrubs is, in general, most creditable to the Park administration; but there are many important problems that can and should be solved by continued study and attention by an experienced plant pathologist. More detailed suggestions will be possible after the second season's work next summer.

Respectfully submitted,

GEORGE M. REED,
Resident Investigator.

NOTES

The large plan of the systematic section of the Brooklyn Botanic Garden, loaned to the Missouri Botanical Garden for an exhibition of landscape architecture during October, 1916 (Brooklyn Botanic Garden RECORD, Oct., 1916), has been shipped to

Columbus, Ohio, for an exhibit on landscape architecture and city planning at Ohio State University.

Mr. Jan Jensen, landscape architect, of Chicago, visited the Garden on November 14, in company with Mr. Gates D. Fahnestock. Mr. Jensen was called to New York in consultation on the matter of the proposed changes in Riverside Park, Manhattan.

On November 1 the director of the Garden addressed the first year's assembly of the Eastern District High School on "The Study of Plants."

The Royal Botanic Society of London has announced an "open air school," at the botanical gardens, Regents Park, for the children of fellows and members of the Society. Pupils are admitted between the ages of four and twelve years.

The University of Pennsylvania has received $25,000 from the estate of Anna Yarnall, the income of which is to be used for the maintenance of the Botanic Gardens of the university.

We learn from *Science* that Stanford University has acquired by purchase the herbarium of Mr. Samuel B. Parish, comprising about 50,000 specimens of the flora of California and the Pacific Coast.

Banana Harvest.—The second bunch of bananas to be grown in our economic house was cut on November 6. There were nearly 300 bananas on the bunch, the total weight of which was 214 lbs. Last year's bunch weighed only 170 lbs. This year's fruit-stalk alone weighed 18 lbs., and the largest "hand" weighed 17½ lbs. Eleven bananas, picked at random, weighed a total of eleven pounds. The relative size of the bunch is well shown in fig. 1. The rapid growth of the banana plant is noteworthy. The sucker from which this year's plant was produced was planted in October of last year, and rapidly attained a height of about thirty feet. The first flowers opened on June 8, and the first fruit ripened about November 6.

The Boys' Club.—The Boys' Club of the Brooklyn Botanic Garden met Saturday afternoon, November 18. These meet-

ings are held four times a year and are for the purpose of discussing work done by the boys in the field of botany and gardening. Four boys received silver pins for special work done independent of class instruction. One lad worked all summer raising various kinds of lettuce such as romaine, heading lettuce, chicory, chervil, and endive. He had a plot at the Garden, made his plantings in this, photographed results and studied the history of lettuce. Another boy made cotton his piece of work. He, too, had a plot at the Garden for his cotton. Corn was chosen for study by another of the boys. He chose two varieties only, laying stress on tests, soils, corn pests, and the various commercial products obtained from the corn plant. The fourth made a study of flowering and flowerless plants making a collection of over two hundred specimens. These boys were all high school students in our local high schools. Mr. Winter, head of department in public school No. 3, spoke to the Club on the value of independent work, and of the training they were receiving, not only in botany and gardening, but unconsciously in expressing themselves before their fellows, in giving public reports of their work. Each recipient of a silver pin told the Club in detail of the work done in order to win it.

The Girls' Club.—At the meeting of the Brooklyn Botanic Garden Girls' Club, on November 25, five girls received silver pins from the Garden. The Garden presents these pins when a boy or girl has done an acceptable piece of work which shall have extended over a period of at least six months time, and is of the character of original work.

These five girls all chose to study common garden flowers. Last spring they performed certain experiments to learn how a seed starts its life, and what it needs for growth. From this they went on to plan out a flower border, which was the one started this summer in front of the individual plots in our children's gardens. These girls did most of the planting of this flower border. They observed the flowering time of each plant, color of its blossom, height of plant and best use of each plant in the border. Such a study resulted in active observation, and in the consulting of many different books, and of course involved considerable garden practice.

High School Classes at the Garden.—The double session plan, in operation at the Bushwick high school annex (at public school 75, Brooklyn), has made it possible for the biology classes at that school to avail themselves of some of the work offered the past fall and this winter at the Botanic Garden. Over 40 pupils, boys and girls, are registered for our course in plant propagation, involving laboratory work in the plant house. The course extends over six weeks, meeting once each week from 2:30 to 3:30 p. m. Three classes in this course were organized, as the number in each class is limited to fifteen, this being all that can be accommodated at one time in the plant house. At the close of this work 45 pupils from Bushwick registered for a second six weeks' course in the study of trees and shrubs. A certificate is awarded for the satisfactory completion of this course. Following this a third course is planned for the study of commercial lumber.

The instructor of these pupils at the high school, Dr. Ralph Curtiss Benedict, reports that the work at the Garden has resulted in marked improvement in the class work in biology at the school. The enthusiasm and interest aroused in the boys has expressed itself in the formation by them of a tree study class.

Children's Work at the Museum of the California Academy of Sciences.—"It is my ambition that there shall be in this museum [of the California Academy of Science] a *Children's Room*—a room in which will be displayed natural history objects such as are particularly attractive to little children. There would be in this room brightly and curiously colored birds and butterflies, moths and beetles and other insects; curious animals of other groups; attractive minerals, growing plants, and aquariums with interesting and instructive animal and plant life; colored transparencies of beautiful native flowers, all selected and arranged with reference to the telling of an interesting story, of teaching a definite lesson.

"And there will be in this children's room a children's reading room in which will be found a library of all the interesting and reliable nature books and helps to nature study.

"And there will be in charge of this children's room a well-

educated, kindly, sympathetic man or woman who knows animals and plants; who knows the specimens in the museum and the live things in the park about it; and who, above all, knows and loves children; a man or woman who can wisely direct the observation and the reading of the children so that they may correlate their reading with what they have seen in the museum or in the open, and thus increase rather than stifle their interest in, and love for, animate things, as our public schools almost invariably do. It will be arranged so that children of the different grades will come to this room at different hours, and receive the instruction and help and encouragement adapted to the *right thing to do,* the right sort of education and training to their respective needs.

"And all this will be done and done soon, I confidently believe. It will be done because it so evidently appeals to us all as being give our children." *Evermann, B. W. Science, N. S.* 44: 602. 27 O 1916.

Graduation of Garden Teachers.—On Saturday afternoon, December 9, 1916, Certificates in Children's Gardening were conferred on a class of thirteen women who have completed our year's course for the preparation of teachers of children's gardening. An address on "The Larger Setting of Nature Study" was given by Dr. Thomas Balliet, Dean of the School of Pedagogy of New York University. After the conferring of certificates, the class of 1916, represented by Miss Maud E. Snedeker, presented the Garden with a beautiful bird bath for the children's gardens. The gift was accepted by Mr. Alfred T. White, chairman of the Botanic Garden Governing Committee of the board of trustees. At the close of the formal exercises tea was served by the Garden Teachers' Association of the Brooklyn Botanic Garden. The members of the class are as follows: Agnes Tisdale Dexter, Florence Elizabeth Diehl, Grace Fahlberg, Anna Marie Gissel, Adelaide B. Harrison, Theodora Hay, Maude Laura Hickok, Ethelwyn F. Humphrey, M. Christine Lietz, Alma Hazelton Raymond, Helen Seaman, Minna R. Streich, Ethel I. Wall.

Gift of woody plants.—On December 5 we received from Mr. Henry Hicks, of Isaac Hicks & Son, Westbury, L. I., the largest

gift of plants since the gift of Mr. Lowell M. Palmer, in 1911. Mr. Hicks's gift comprises about 600 evergreens, including about 300 *Taxus cuspidata* (6–8 inches), 50 *Taxus canadensis* (9–12 inches), 100 *Duglass spruce* (6–8 inches), and 30 *Abies concolor*, (about 1 ft). There are about 2000 deciduous trees and shrubs. This material includes a number of specimens for the scientific collections, but the bulk of it is duplicates to be utilized for the ornamental and utilitarian planting. The gift could not have been made at a more opportune time to meet the needs of the Garden. Much of it has already been planted for the border screen on the new mounds near the Malbone Street gate.

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PUBLICATIONS

OF THE

BROOKLYN BOTANIC GARDEN

RECORD. Established January, 1912. An administrative periodical, issued quarterly. Contains, among other things, the annual report of the director and heads of departments, special reports, announcements of courses of instruction, miscellaneous papers, and notes concerning Garden progress and events. Free to members of the Garden. To others one dollar a year; 25 cents a copy.

CONTRIBUTIONS. Papers originally published in botanical or other periodicals, reissued as "separates," without change of paging, and numbered consecutively. This series includes occasional papers, as well as those embodying the results of research done at the Garden, or by members of its staff or students. Twenty-five numbers constitute one volume. Price 25 cents each, $5.00 a volume.

4. *On the origin and present distribution of the pine-barrens of New Jersey.* 15 pages, figs. 2. 1912.

5. *Ingrowing sprouts of Solanum tuberosum.* 10 pages, figs. 6; plate 1. 1912.

6. *Intermingling of perennial sporophytic and gametophytic generations in Puccinia Podophylli, P. obtegens and Uromyces Glycyrrhizae.* 15 pages, 1 plate. 1913.

7. *Studies of teratological phenomena in their relation to evolution and the problems of heredity. I. A study of certain floral abnormalities in Nicotiana, etc.* 14 pages, figs. 4. 1914.

8. *Some observations on the formation of the capillitium and the development of Physarella mirabilis Peck and Stemonitis fusca Roth.* 15 pages, 2 plates. 1914.

9. *The growth-forms of the flora of New York and vicinity.* 9 pages. 1915.

10. *Inheritance studies in Pisum. I. Inheritance of cotyledon color.* 18 pages, 4 tables. 1916.

11. *Studies of teratological phenomena in their relation to evolution and the problems of heredity. II. The nature, causes, distribution and inheritance of fasciation with special reference to its occurrence in Nicotiana.* 29 figures, 30 tables. 1916.

12. *Endemism in the flora of the vicinity of New York.* 10 pages. 1916.

13. *The origin of new varieties of Nephrolepis by orthogenetic saltation. I. Progressive variations.* 28 pages, 6 plates. 1916.

14. *A white cedar swamp at Merrick, Long Island, and its significance.* 10 pages, 5 plates. 1916.

15. *Present status of the problem of the effect of radium rays on plant life.* 8 pages. 1916.

GUIDES to the collections, buildings, and grounds. Price based upon cost of publication.

LEAFLETS. Established April 10, 1913, and published weekly or biweekly during April, May, June, September, and October. The purpose of the Leaflets is primarily to give announcements concerning flowering and other plant activities to be seen in the Garden near the date of issue, and to give popular, elementary information about plant life for teachers and others. Current numbers free to all who wish them. Back series complete, 50 cents each; back numbers, 5 cents each.

SEED LIST. Issued in December of each year.

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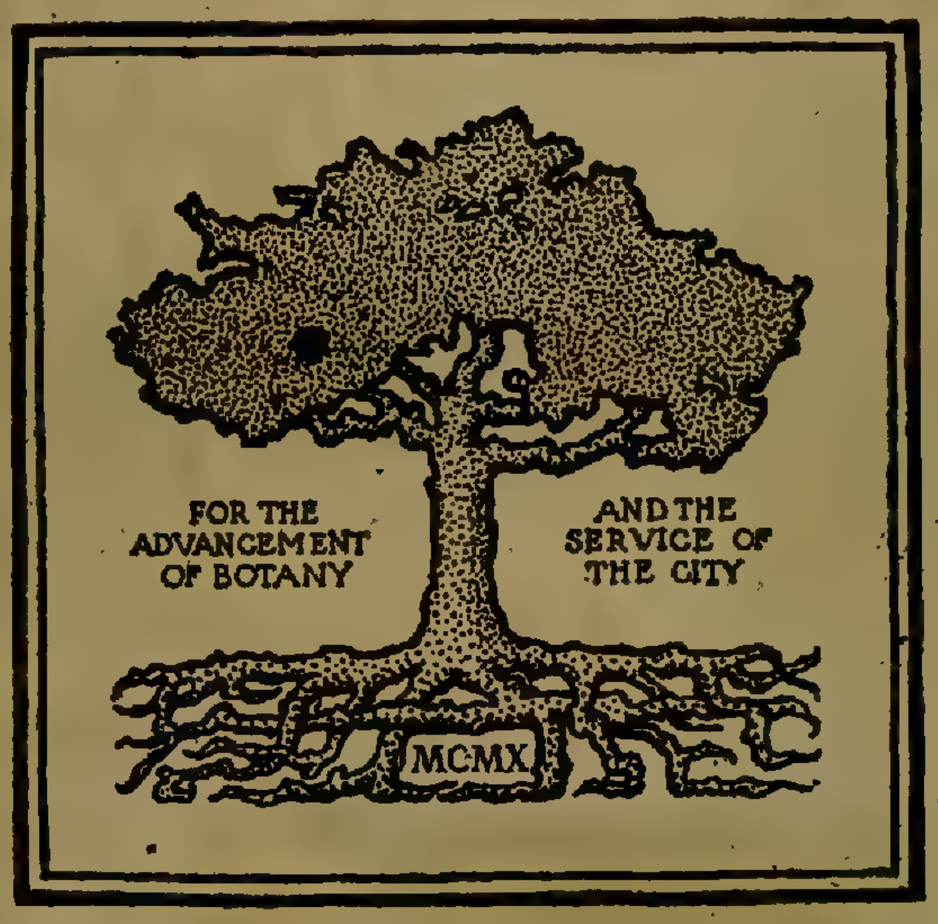

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FIG. 1. Laboratory building, October 11, 1916. View from the Garden, facing east. (*Cf.* Fig. 2.)

THE BROOKLYN INSTITUTE OF ARTS AND SCIENCES

BROOKLYN BOTANIC GARDEN

RECORD

VOL. VI April, 1917 No. 2

SIXTH ANNUAL REPORT OF THE BROOKLYN BOTANIC GARDEN, 1916

REPORT OF THE DIRECTOR

TO THE GOVERNING COMMITTEE OF THE BOTANIC GARDEN:

Gentlemen: I have the honor to submit herewith the sixth annual report of the Brooklyn Botanic Garden, of the Brooklyn Institute of Arts and Sciences, for the year ending December 31, 1916.

Progress of New Buildings

Laboratory Building.—The contractors began laying concrete footings for the last four sections of the laboratory building on January 28, and the work continued with reasonable progress throughout the year. The corner stone was laid by the chairman of the governing committee on Thursday, April 20, at 4:30 p. m., with simple ceremonies. A full account of these exercises, together with a list of objects deposited in the stone, appeared in the BOTANIC GARDEN RECORD for July, 1916.

The contract time of 300 days, beginning December 20, 1915, will extend into next year, but it should be possible to dedicate the building in the spring of 1917.

Conservatories.—The closing year saw the enclosure of the northeast and the two south wings of the main conservatories, and of the propagating house. By courtesy of the contractors the

southeast wing was occupied in October, house No. 6 with a study collection of varieties of the Boston fern, and house No. 7 with a collection of cacti and other succulents, both installations being temporary. The three wings and the propagating house are known together as the "third section of the greenhouses," having been constructed under the third contract.

Children's Building.—The distance from the laboratory building to the children's gardens and other considerations of convenience, made necessary the erection, on the site of the gardens, of a small building to serve for the storage of tools, registration, and toilet accommodations. In the preparation of plans an endeavor was made to secure a design suggestive of a home rather than of a public building, and along colonial lines. Bids were opened by the Park Board on June 1, as follows:

1. List of Bids for All Labor and Materials Required for the Erection and Completion of the Children's Garden Building, General Contract

Finnan & Lee, 155 Rogers Ave., Brooklyn	$ 5,220
Frymier & Hanna Co., 25 W. 45th St., N. Y. City	5,381
Bernard Knopp, 431 W. 41st St., N. Y. City	5,584
The Alpha Painting Corp., 103 Park Ave., N. Y. City	5,713
Samuel Rosen, 706 Fairmount Place, Bronx, N. Y. City	6,067
B. Diamond, 12 Bergen St., Brooklyn	6,100
J. M. Knopp, 544 W. 43d St., N. Y. City	6,198
Winkler Construction Co., Inc., 299 Broadway, N. Y. City	6,900
Rockiron Construction Co., Inc., 52 Vanderbilt Ave., N. Y. City	6,920
Petley & Weber, 305 59th St., Brooklyn	14,027

2. List of Bids for All Labor and Materials Required for the Erection and Completion of the Plumbing, Drainage, Water-Supply System, and Plumbing Fixtures Required for the Children's Garden Building

Thomas E. O'Brien, Inc., 6311 5th Ave., Brooklyn	$ 1,188
R. & T. Isaacson, 250 E. 125th St., N. Y. City	1,249
Joseph A. Graf, 971 DeKalb Ave., Brooklyn	1,282
Altman Plumbing Co., 802 2d Ave., N. Y. City	1,338
P. A. McCamley, 394 Halsey St., Brooklyn	1,400
Christopher Nally, 710 Columbus Ave., N. Y. City	1,442

Contracts were awarded on the same date to the lowest bidders, as follows:

General construction, Finnan & Lee	$ 5,220
Plumbing, drainage, water supply, etc., Thos. E. O'Brien, Inc.	1,188
Total	$ 6,408

The contract time of 65 working days for the above work began on June 30, 1916, but up to December 31 the building had not been completed.

FIG. 2. Laboratory building, summer, 1915. View from the Garden, showing first (south) section, completed September, 1913; at the left, site of the new sections nearing completion in December, 1916. (*Cf.* Fig. 1.)

New Contracts

Fourth Section of Greenhouses.—The forms of contracts, plans, and specifications for the completion of the fourth section of the greenhouses were approved by the comptroller on August 16, 1916. This section is the range of three houses between the first section and Washington Avenue. Bids for the three contracts, including general construction, plumbing, etc., and heating, were opened on December 7. No bids having been received for the heating work, this contract was readvertised for bids, to be opened on December 28. Bids were received as follows:

1. GENERAL CONTRACT (DECEMBER 7)

Frymier & Hanna Co., 25 West 45th St., N. Y. City	$ 9,139
Kelly & Kelly, Inc.	10,100

2. PLUMBING (DECEMBER 7)

Edward Harley, 870 Flatbush Ave., Brooklyn	297
Altman Plumbing Co.	385
Christopher Nally	429
Thomas F. Breen	600

3. HEATING (DECEMBER 28)

W. K. Moran & Co., 405 Lexington Ave., N. Y. City	1,547
E. G. Butterfield	1,643
Adams, Britz & Co.	1,679
W. J. Olvany	2,126
S. Jacobs & Son	3,000

The total amount of lowest bids for the three contracts is $10,983.00. The contracts will not be awarded until 1917.

Construction of Rock Garden.—On March 23, bids for the construction of a rock garden (exclusive of planting) were opened by the Board of Park Commissioners as follows:

Thomas Guidera	$ 1,349
P. T. Cox	1,364
Edward F. Monahan	1,495
Louis J. Sieling	1,767
Garfield Williamson	1,970
George H. Mooney	1,985
Joseph Jennings	4,500

The contract was awarded on the same date to the lowest bidder, Thomas Guidera, 86 Forty-first St., Corona, L. I. The work was begun on April 10, in advance of the execution of the contract, and completed on May 6.

Development and Maintenance of Grounds

The developmental work of the year included the grading and soil improvement operations on about five acres of the south addition, the shaping, top-soiling, and initial planting of border mounds along the Flatbush Ave. and Malbone St. fence lines, the extension of the brook by about 600 ft. across the new land to a new terminal pool, the building of a boulder bridge where the extension of the brook crosses one of the bituminous macadam walks, the extension of the irrigation system to the south addition

(by open market order against corporate stock), and the construction and initial planting of the rock garden, referred to above. A more detailed account of these and other operations is contained in the appended report of the curator of plants.

The season of outdoor work, covering 38 weeks, was the longest in the Garden's history; this was made possible by a generous contribution of private funds for wages, combined with an unusually late open season, continuing until December 16. During this period the laboring force varied from 7 to 34 men. The curator of plants has called attention to the fact that the large amount of constructive work was accomplished at the partial expense of upkeep of grounds. It is anticipated, however, that by the end of next year the largest developmental operations now before us will have been accomplished.

Annual Spring Inspection

The second annual spring inspection was held on Tuesday, May 9. About 200 guests were present. Trees were planted by the president of the Brooklyn Institute of Arts and Sciences, Mr. A. Augustus Healy, and by the chairman of the governing committee of the Garden, Mr. Alfred T. White. The tree planted by Mr. White was a white oak (*Quercus alba*), that by Mr. Healy, a black oak (*Q. velutina*). Preceding the formal exercises of the afternoon trees were also planted by the Misses White—a swamp oak (*Quercus palustris*) by Miss Frances E. White, and a red oak (*Q. coccinea*) by Miss Harriet H. White. The inspection concluded at the Japanese garden, where tea was served in the tea house.

Plantations

Maintenance.—The steady increase of our labeled specimen plants, including both shrubs and herbs, has made it almost impossible to give these plants adequate care. The work requires experienced gardeners, and we have had only three during the year, supplemented by the assistance of one or two unskilled laborers. This force is not adequate to the needs of both the plantations and the conservatories, and by 1918, at the latest, two or more

gardeners should be added to our regular force. It has not yet been possible to re-install the economic and morphological sections, temporarily discontinued two years ago on account of grading operations. These collections were of great popular interest and should be resumed as soon as may be. A detailed statement of the season's planting will be found in the report of the curator of plants (pp. 48–49).

Winter Killing of Evergreens.—The winter of 1915–16 was one of the worst for evergreens in nearly twenty years. Throughout the northeastern states, especially along the seaboard from Boston to New York, all evergreens suffered badly. The Garden lost over 80 specimen trees and shrubs, valued at over six hundred dollars. An account of this loss was published in the Garden RECORD for October. As there stated the high mortality is doubtless explained by the concurrence of abnormally high air temperatures, strong winds, and diminished precipitation in the first three months of the year. During this same period the low soil temperatures and deficiency of precipitation reduced the absorption of moisture by the roots at the very period when the loss by transpiration from the evergreen foliage was high. In other words, the plants succumbed to unusual drought.

Fern Garden.—The Botanic Garden has been made the depository of the American Fern Society for its collection of hardy living ferns. The details of the fern garden have been planned by Dr. R. C. Benedict, resident investigator, and a full account of this collection will be found on pages 50 to 52 *infra*. The number of species has been increased from 52, as reported in September, to about seventy-five.

Rock Garden.—One would never deliberately choose newly uncovered glacial boulders as the most desirable material for a rock garden. As glacial boulders, however, are the only rocks in any sense "native" on Long Island, and as we had on hand a large surplus, uncovered during the grading of the north addition, the suggestion was at hand to utilize them for a rockery. Only a beginning could be made of the rock planting last season, but with anticipated additions of alpine and saxatile species next spring, the garden should soon become one of our most popular and botanically most interesting features.

Japanese Garden.—The popularity of the Japanese garden increases each year. During the past spring the hill, "heaven," was raised several feet in height, and thickly planted with azaleas, and the three American spruce trees back of the tall stone lantern (*Okuno-in*) have been replaced by specimens of the more appropriate Japanese tree (*Cryptomeria japonica*). As the vegetation becomes established the garden becomes yearly more convincing and more satisfactory.

Lilac Collection.—The lilac collection is planned to occupy the triangular area northwest of the museum esplanade, extending thence down the walk west of the esplanade. Within a few seasons this collection should become one of great beauty. About 130 varieties were planted last spring; the number should be doubled in 1917.

FIG. 3. Laboratory building. Laying the corner stone, April 20, 1916. From left to right, Mr. Alfred T. White, Mr. A. Augustus Healy, Dr. C. Stuart Gager.

Conservatories

Continued Congestion.—The new wings of the conservatories afforded no relief to our congestion until late October, when houses 6 and 7, comprising the southwest wing, became available.

Popularity of the Economic House.—The collection of tropical and subtropical economic plants in the economic house becomes more popular each year, especially with classes accompanied by their teachers from public and private schools. Already one begins to look forward to the time, not far distant it is hoped, when this collection may be installed in quarters at least twice as commodious.

Maintenance and Administration.—During the fall, snow guards were placed on the main roof at the ends and along the south edge of the lantern, as a protection against snow and ice that fall at times from the roof of the lantern. The labeling of the conservatory plants has been begun, but we shall start the new year with several hundred unlabeled plants. The total attendance at the conservatories for the year has been over 18,000, a marked increase over 1915. This figure is really very significant and equally encouraging when one recalls the small size of our collection, its congested and partially unlabeled condition, the fact that it has been accessible only through what was originally intended for a service entrance, and the further fact that during at least three warm months of summer the interior of glass houses offers slight attraction to visitors.

Library

Growth.—The librarian's annual report shows a total of 11,193 books and pamphlets, as against 9,689 at the close of 1915, a growth of 1,504. This was a smaller growth than during the preceding year, but the shelf room of the temporary quarters is already full to capacity. Out of a total accession of 567 volumes for the year, 228 were received by gift and exchange, and out of 937 pamphlets, 848 by gift and exchange. Of 258 current periodicals received, 194 were in exchange with our own publications. A list of the current periodicals on file, as of August, 1916, was published in the RECORD for October, together with indications as to other libraries of greater New York where they may be found.

Valuation of the Library.—Below is given a tabular statement of the value of our library on December 31. Special attention is called to the fact, there shown, that with a total cash value of publications of $16,944.20, the total cash expenditure, including binding, has been only $6,181.08, or only about $1,000 a year. The remaining $10,763.12 represents the value of exchanges and gifts during the past six years.

APPROXIMATE VALUATION OF LIBRARY PROPERTY, AS OF DECEMBER 31, 1916

1. Value of books now in library (Includes Museum transfers, purchases, gifts and exchanges, and binding.)	$11,800.58
2. Value of pamphlets (6,827, estimated at an average value of 50 cents each)	3,413.50
3. Value of current serials (excluding Federal and State publications) being received	426.34
4. Value of publications now received in exchange for *American Journal of Botany*	199.61
5. Value of publications now received in exchange for RECORD, *Leaflets* and *Contributions*	49.70
6. Value of Torrey Club cards, U. S. D. A. Experiment Station cards, and *Universalis algarum* cards	157.17
7. Total value of all other items not included above	682.30
8. Labor and materials, exclusive of librarian's salary (conservative estimate)	215.00
9. Total cash value of publications and index cards (Includes Museum transfers, purchases, gifts and exchanges, binding; pamphlets, back serials and 1916 serials, and index cards.)	$16,944.20
10. Actual cash expended on the purchase of publications and on binding since the library started, and up to Dec. 31, 1916 (Includes accessioned books, binding and subscriptions noted on current periodical cards for the years given.)	6,181.08
11. Value of exchanges and gifts received during past six years	$10,763.12

Needs.—Libraries are probably never without needs. In this respect they are not unique. The needs of a young library are naturally larger and more pressing than those of an older one. The average annual expenditure, noted above, of only $1,000 for the initial years of a highly specialized reference library represents most rigid economy, and has, of course, been quite inadequate to our needs. The yearly cost of binding alone now

amounts to about one half the total funds available. Several invaluable and expensive sets are lacking from our shelves, and they are becoming rarer and more expensive annually. It has not been possible to carry on the scientific investigations of the past year without numerous borrowings from other libraries, even from other states.

I have elsewhere indicated the need of a fund of at least $5,000 for immediate expenditure. An itemized statement of how such a fund could at once be used to advantage will be gladly submitted to any one interested. The sum named is a conservative one. The occupancy of our permanent and commodious quarters early next spring will remove the embarrassment to rapid and large expansion which has hitherto obtained.

Herbarium

Accessions.—A total of 5,325 herbarium specimens have been accessioned, 3,032 being phanerogams and 2,293 cryptogams. Of these, 2,999 were obtained by purchase, 880 by collection, 468 by exchange, and 978 by gift. In January we received from Dr. E. B. Southwick, for about thirty years entomologist of Central Park, New York, his entire herbarium collection estimated at about 30,000 specimens.

New Cases.—Mention was made in my preceding annual report of the need of at least four new double-faced metal cases to care for the anticipated increase in our collections during 1916. In November orders were placed for three of these cases, two to be purchased from corporate stock, and one from the tax budget funds.

Needs.—As noted last year, the work of mounting and other physical care of the herbarium collection is sufficient to justify the appointment of a herbarium assistant on full time. Several thousand specimens are still unmounted in addition to the 30,000 presented by Dr. Southwick. With only a part of the time of an assistant available, it has been possible to mount only a few over 4,000 specimens during the year. Additional herbarium cases are also needed.

The Staff

Assistant Curator of the Herbarium.—In January Dr. Alfred Gundersen was made assistant curator of the herbarium, a newly established position.

Librarian.—On August 4, Dr. Laura E. Watson Benedict, librarian since January 1, 1915, resigned; Miss Ray Simpson, her successor, entered upon her duties on September 18.

Number of Monthly Employees.—Our monthly pay roll for December showed a total of 27 monthly employees; of this number, 22 received their salaries from the tax budget and 4 from private funds; one received his salary in part from both funds.

Needs.—The enlargement of our buildings to over five times

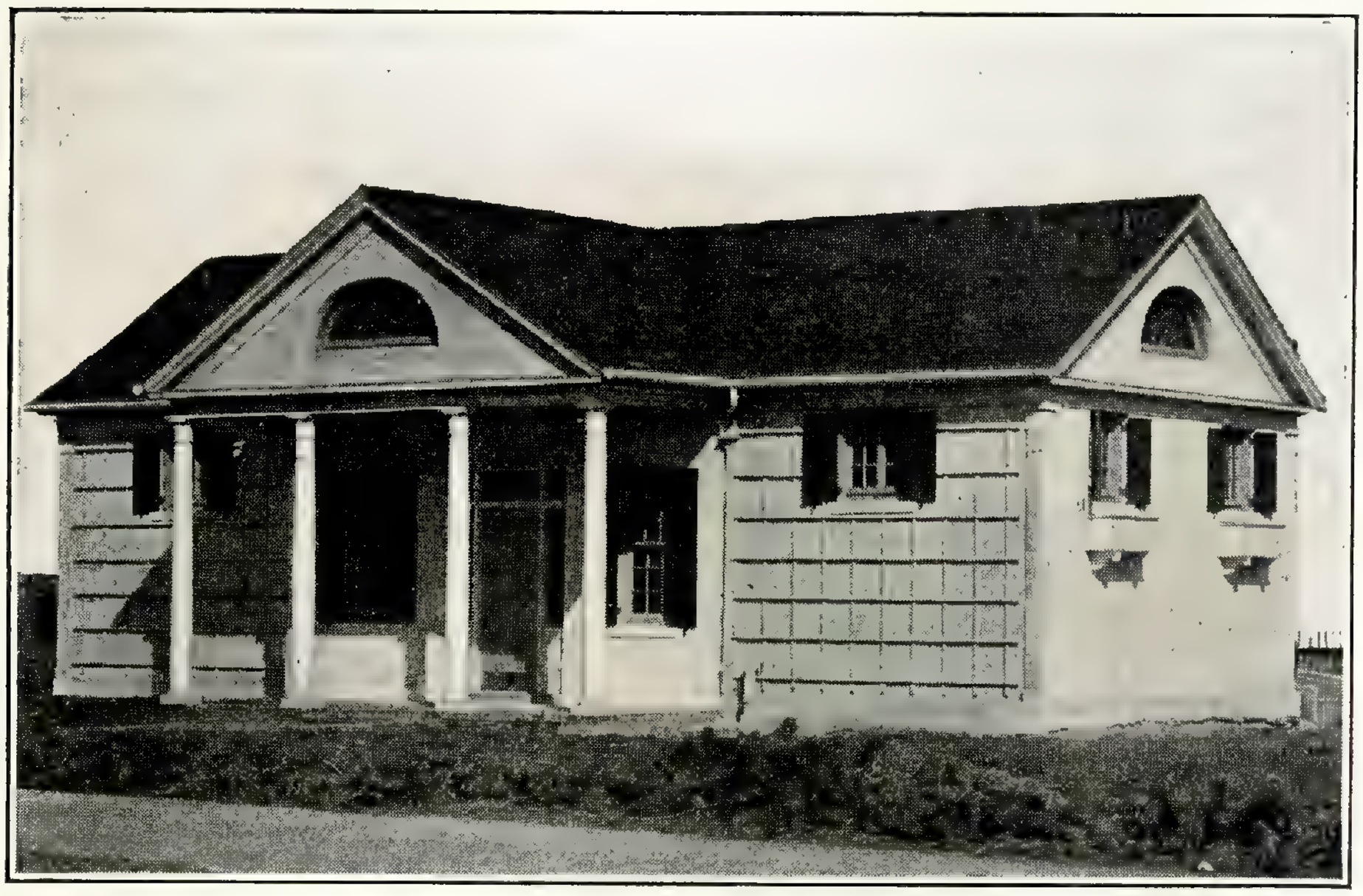

FIG. 4. The children's building, facing east.

their size hitherto will necessitate the appointment, early in 1917, of a registrar and custodian of buildings, to have entire charge of and responsibility for the physical upkeep of the buildings and, as registrar, to keep records of all outgoing and incoming shipments, and to serve as custodian of our stock rooms and publication room.

Department of Public Instruction

Attendance.—Our work of elementary instruction, especially with children and young people, increases in amount and improves in quality each year; best of all, it increases without the need of special effort on our part. Over 2,600 persons have registered in regular Garden classes during the year, with a total attendance of over 14,000, as against 9,100 in 1915; an increase of 4,900. Over 8,500 pupils of local schools have visited the Garden in classes accompanied by their teachers, an increase of more than 1,900 over 1915. Each of these classes has been given individual attention, and often, in the case of large groups, the class has been handled in sections, thus insuring more individual attention to each pupil. Sixty-eight extra-mural addresses and talks have been given to audiences totaling 18,000. Our work of public instruction has, during the year, reached a grand total of more than 40,000 persons.

Children's Gardens.—The children's gardens were opened on their new and permanent site at the southern end of the grounds on May 6.

Children's Horticultural Exhibit.—The third annual children's horticultural exhibit was held on September 29 and 30, and while the epidemic of infant paralysis resulted in a somewhat smaller exhibit than in 1915, there was a marked improvement in quality. A full account of this event may be found in the Garden RECORD for October.

Penny Packets of Seeds.—Over 111,000 packets of vegetable and flower seeds were supplied to Brooklyn children last spring, an increase of about 25,000 over 1915.

Boys' and Girls' Clubs.—The organization of a Boys' Club on April 15, and of a Girls' Club one week later has already been noted in the RECORD. The movement to organize these clubs originated spontaneously with the boys and girls, but has received careful guidance and every encouragement from the department of public instruction. The membership of the Boys' Club has increased from 150 to 500, and that of the Girls' Club from 100 to 400.

Needs.—The most pressing needs in connection with our work of public education will be met next year by the completion of our

laboratory building, and especially by a new plant house that will afford additional space for laboratory work in the greenhouse

Investigations

Plant Disease Survey.—In my last annual report (p. 44) I recorded the appointment of Prof. W. H. Rankin to the newly established research fellowship. The primary purpose of this appointment was to make a survey of the diseases of the trees and shrubs of Prospect Park and the Botanic Garden. Professor Rankin was finally unable to undertake the work, but the Garden was fortunate in securing the services of Prof. George M. Reed, of the University of Missouri, who was in residence from June 15 to September 15. A preliminary report of his first summer's work will be published in the Garden RECORD for January, 1917. It is anticipated that this investigation will enable the Garden to contribute toward the solution of the difficult and highly important problem of the control and eradication of the diseases of the trees and shrubs of the parks and parkways of the city.

Plant Rust Studies.—From February 19 to May 1 Doctor Olive was absent in Porto Rico, in company with Professor Whetzel, of Cornell University, for the purpose of studying and collecting plant rusts, an important group of phytopathogenes in which he is specially interested. Such trips as this not only afford valuable opportunities for research, but also result in the enrichment of our scientific collections. It is hoped that in the near future provision may be made for such trips as a regular part of our research work.

Plant Breeding.—Experimental investigations of heredity and variation in peas, castor beans, and corn, as previously reported for 1915, have been continued during the year, by and under the direction of the curator of plant breeding. These studies have yielded a large amount of data concerning the laws of inheritance of the numerous characters in these plants, and by extension, the laws of heredity in general. Peas have furnished the best material for these studies, and in collaboration with the Bureau of Plant Industry of the U. S. Department of Agriculture, between two and three hundred varieties have been collected from all over the world, including some especially interesting wild and semi-

wild forms from Trans-Caucasia, Abyssinia, western China, Persia, and Palestine. These have been grown in the plant-breeding plots of the Garden, and in bench and pot cultures in the greenhouse. Herbarium material has been collected from them and pure strains have been isolated. Hundreds of crosses between these strains and varieties have been made from which thousands of new forms have been obtained, some of which may prove to be better adapted to our climatic conditions through their ability to stand hot weather.

Studies on the inheritance and nature of productiveness in peas are being emphasized, as well as the relation of different environments to this and to other pea characters. Eventually, through these studies, it is hoped to make known the manner of inheritance of all the character differences in peas and, from this knowledge, to be able to synthesize a desired variety by bringing together certain characters through crossing, much as one does in chemistry in making desired compounds. Material as favorable for the theoretical study of the laws of heredity as are peas, is rare, and it is needless to point out how obviously agricultural and horticultural breeding is dependent on theoretical studies of heredity. Practical plant-breeding such as that of Lemoine, Burbank, and others would not now be possible if it were not for the theoretical studies made during the preceding centuries, any more than it would be practicable or possible to build bridges without our present knowledge of the laws of physics.

The experiments on castor beans involve the same aims as those mentioned for peas, though special emphasis is being laid on several characters of economic importance having to do with their value as ornamental and oil producing plants.

In addition to the experimental work on peas and castor beans, Miss Stella G. Streeter is investigating, under Dr. White's direction, the heredity of various characters in corn, several of which involve productiveness. About thirty very distinct varieties of corn are usually grown on the grounds for experimental purposes.

At present the plant breeding and heredity work is much hampered through lack of sufficient greenhouse space for growing winter cultures, and through insufficient clerical and gardening assistance for keeping pedigree records and taking proper care of

the cultures. No considerable extension of the summer work will be possible unless additional space can be secured for field cultures. A calculating machine of the best and most accurate type is specially needed to facilitate the statistical side of the work.

Boston Fern Investigation.—Dr. Ralph C. Benedict, resident investigator, has continued his investigations of variations in the Boston fern (*Nephrolepis*). About 150 varieties of this fern have been assembled at the Garden, and four papers have been published (See Appendix 1). The work has included a description of the varieties of *Nephrolepis* produced by progressive variation, and a study of those produced by reversion. A study of similar types of variation among ferns in general has been undertaken, and also a study of the spore-grown progeny of some of the variant forms, involving the phenomenon of alternation of generations. On Friday afternoon and evening, December 29, the American Fern Society held two sessions of their annual meeting at the Garden, in order that the members might have an opportunity to view the collection of *Nephrolepis* varieties, which probably contains the largest number of forms ever assembled in one place.

Local Flora.—The intensive survey of the flora of Long Island by Mr. Taylor, noted in my preceding report, has been continued during the year, including a study of herbarium and library material, and numerous field trips for study and collection. A small fund should become available in 1917 to meet the traveling expenses in connection with these field trips.

Publications

Record.—Volume V of the Brooklyn Botanic Garden Record contained 160 pages (23 more than in 1915), and 8 half-tone illustrations.

Leaflets.—Series IV of the *Leaflets* comprised 14 numbers, appearing weekly or bi-weekly from April 5 to October 25.

Contributions.—Seven papers have been published during the year as Contributions, Nos. 10–15, and 17. Number 16 is now in press.

American Journal of Botany.—The third volume of the *Journal* contained 593 pages, 94 text-figures, and 24 plates. For the first

time in the three years of its existence the *Journal* has been self-sustaining. Sufficient manuscripts were in the hands of the editor-in-chief to make a larger volume had the financial resources warranted the necessary expenditure.

Miscellaneous.—The *Seed List* for 1916 offered 991 species, an increase of 221 over 1915. In December the *Prospectus of Courses* for 1917 was issued in advance of its regular publication in the RECORD for January, 1917. Forty separate courses of instruction are offered, in addition to 11 courses to be repeated during the summer. The individual publications of members of staff (given in detail on pages 89–92) total 40 articles and papers and two books.

Garden Membership

The total membership of the Garden is 151, as follows: annual 99, sustaining 44, subscribing 2, life 6.

Financial Matters

Municipal Appropriation for Maintenance.—The amount appropriated in the tax budget for the maintenance of the Garden in 1916 was $38,135.10, an increase of $1,010.60 over 1915, but $4,096.43 less than the expenditures that were considered either necessary or very urgent. The deficiency was made good by private contributions.

Corporate Stock Balances.—Of corporate stock appropriations there is a balance of $60.15 on C.D.P. 200-J, a balance of $9,709.36 on C.D.P. 200-M, and a balance of $10,096.72 on Suspense Account (S-566). No balances remain on accounts C.D.P. 200-K and C.D.P. 200-L.

Private Funds.—The total income from private funds, including interest on endowment, gifts, membership dues, and income from tuitions and sales, but not including additions to endowment principal, was $13,143, a decrease of $3,796.05 under 1915. The endowment fund increased by $26,000, making a total endowment of $78,000.*

* By an error the amount of the Garden endowment, as of December 31, 1915, was stated in the preceding annual report (p. 49) as $125,500, instead of $52,000.

FIG. 5. Children's gardens, summer, 1916. At the farther (north) end is the children's building in process of erection.

Needs of the Garden

Increased Municipal Appropriation for Maintenance.—For the past two years the city appropriations for maintenance have not been adequate to meet actually necessary expenditures, not to speak of additional expenses deemed essential for efficient maintenance and for a reasonable amount of annual developmental work. At the beginning of the year nothing had been done, except the construction of walks, toward the development of about five acres comprising the south addition, and yet this area is prominently located and is probably the most thickly traversed portion of our grounds. Formerly crossed by a roadway, and having served for a number of years for the deposit and burning of refuse from Prospect Park, it was sorely in need of grading, soil improvement, seeding and shrub planting, but our city appropriation for labor was barely sufficient to maintain already developed areas in a creditable manner. Had it not been for private contributions it would have been necessary for us to have done almost no developmental work, or else to have discharged all of our day laborers in July.

Two years ago it became absolutely necessary to appoint an assistant secretary to serve as stenographer to the director and as assistant to the secretary of the Garden in the general work of the public office. The city has for two years declined to make an appropriation for the salary of this position, so that for 1917, as for 1915–16, the salary must be met from private funds.

It will also be necessary to provide private funds next year for a custodian of buildings and for additional janitor service, made necessary by the completion of our laboratory building and plant houses, which gives over five times as much building to be cared for as we have had hitherto.

The most unfortunate feature of this situation is that private funds used for maintenance are diverted from the important educational and scientific work for which the Garden was primarily established. The maintenance of our plant thus involves the crippling and curtailing of the work for which the plant exists.

Increased Endowment.—Of the entire income credited from endowment for 1916 ($3,327.79), all but $324.14 was needed for salaries, and has been similarly assigned in the private funds

budget adopted for 1917. This leaves the Garden entirely dependent upon special gifts of uncertain amount for the purchase of plants and books, the prosecution of scientific investigations, and the publication of the results of research. What the Garden sorely needs at once is an endowment fund of not less than $500,000, assuring an annual income of approximately $25,000, and restricted by the terms of gift to our scientific and educational work. Later this amount will need to be increased.

Improvements and Replacements.—Special mention may appropriately be made here of two or three large items among numerous needed improvements and replacements, namely, a new fence, new entrance gates, water pools west of the conservatories, and a retaining wall and planting at the museum embankment. To care for these items an issue of corporate stock should be requested from the City.

Nursery and Experimental Plot.—Attention was called to this need in my preceding report. If the matter is not too long delayed it would doubtless be possible to acquire title to two or three acres of unimproved land in one of the more thinly settled districts not far from the Garden. This need will become increasingly urgent and increasingly difficult to meet each year.

Woman's Auxiliary.—The advantages of a woman's auxiliary was also noted in my preceding report. It is anticipated that steps may be taken to form such an organization early in 1917.

Aims and a Program for the Second Five Years.—I have indicated, in Appendix 1, the main lines along which the Garden should develop during its second five years, and the financial provision necessary to secure this development.

Acknowledgments

The gifts made to the Garden during the year have all been acknowledged with thanks by the trustees, as reported at the regular monthly meetings of the board. It is a pleasure to record here the appreciation of the director and staff to all donors; most of their names and gifts are mentioned in the appended reports of curators. Special mention should be made of the gift of about 245 cacti and other plants by the New York Botanical Garden; the gift of his private herbarium by Dr. E. B. Southwick; the

largest single gift of the year to our library by Mrs. Clarence R. Hyde; a gift of about 600 evergreens and about 2,000 deciduous trees and shrubs by Mr. Henry Hicks; a contribution of $50 from Mr. T. H. Lamprecht, 230 Fifth Avenue, New York, toward the phytopathological survey of the Park and Garden; the gift of a beautiful bird bath by the teachers training class of 1915; and contributions to the Botanic Garden Collections found for 1916, from the following subscribers:

Frank L. Babbott
Frank Bailey
Edward C. Blum
Mary A. Brackett
William H. Childs
Walter H. Crittenden
Anton Eilers
John W. Frothingham
A. Augustus Healy
Mrs. John B. Lord
Horace J. Morse
Adolph Müller
Henry F. Noyes
Harold Somers
Herman Stutzer
Clifford S. Trotter
Alfred T. White
Miss Frances E. White
Miss Harriet H. White
Miss M. B. Woodward

Accompanying Papers

The following papers and documents are appended as a part of this report:

1. Annual report of the curator of plants.
2. Annual report of the curator of public instruction.
3. Annual report of the librarian.
4. Financial statements of municipal appropriations and private funds accounts.
5. Appendices I–II.

Respectfully submitted,

C. Stuart Gager,

Director of the Garden.

REPORT OF THE CURATOR OF PLANTS FOR 1916

DR. C. STUART GAGER, DIRECTOR.

Sir: I take pleasure in submitting my report as curator of plants for the year ending December 31, 1916.

General Maintenance and Construction Force

The laboring force worked longer than for any other year in the Garden's history, beginning on March 23 and stopping December 16. During our busiest time, of construction work, we had 14–21 men for 15 weeks and 28–34 men for 5 weeks. This left for purely maintenance work, during the 18 weeks not thus accounted for, an average of 7–13 men. While the construction work was of course necessary in order to open up the new ground at the south end of the Garden, the consequent drain on funds that might have gone into maintenance was great, and was reflected in the far from satisfactory condition in which the rest of the grounds were kept during the past year. Mowing, weeding, and general care of walks, gates, steps, etc., need more men than we could possibly spare for them this year.

The chief new work done by this force has been the grading and completion of the brook on the new land at the south end of the grounds. More than 600 feet were thereby added to the brook, and a terminal pool, larger than any other along the stream, was made. On the south border of this pool a small hill was thrown up, on the slopes of which it is planned to plant rhododendrons and azaleas. Lawn was put down on the west side of the brook, while the east side and adjacent land has been planted with rye—a final step in the soil-improvement scheme.

Other work by this force has been as follows: Fencing and preparation of experimental garden on the new land; preparation of new land for the children's gardens; digging foundation trenches for the northwest section of the greenhouses; shaping, and preparation for planting, of 650 feet of border-mound along Flatbush Avenue and the Brighton Beach R. R. cut; raising border mound at southerly end of museum esplanade; clearing of part of the work yard and preparation of it for the permanent nursery; construction of rubble-stone bridge over the path crossed

by the extension of the brook; construction of fern garden (see p. 50); new paths made and a hill raised in Japanese garden; and about 3½ acres of lawn put down on a piece of land just west of the museum esplanade.

It should be said that, for so much of this work as came on the new land, the results appear small in comparison with the outlay, but it should be added that no land that has ever come to us has been so unpromising for a garden. It was used as a dump for years, and the accumulated rubbish made a good deal of clearing-up necessary before the real work of grading and building the brook could begin. This force has also dug hundreds of holes for plantings by the gardeners.

Gardening Force

A good deal of purely decorative planting, and an increasingly larger area under cultivation, has made it necessary to curtail the increases to the systematic collections during the year. Reference to the number of accessions, especially those raised from seed, shows a decrease from 1915. This is an unfortunate necessity for which the remedy appears to be increased help for this force. With 3 gardeners, 2 helpers for part of the time, and some assistance from the laboring force, it is impossible properly to maintain collections already started and at the same time make additions. Shortage of gardeners means not only difficulty in increasing collections, but more often it means insufficient care of existing ones, or worse still, the unskilled attention of substitutes who are not trained. Our collections are already becoming sufficiently valuable so that relatively ignorant help may be a serious menace.

Besides maintenance of existing collections, and in spite of the conditions outlined in the preceding paragraph, new work done by this force during the year has been as follows:

1. Planting 160 Austrian pines around the lake.
2. Planting 72 rhododendrons around the lake.
3. Arbor-vitae hedge, about 250 ft. long, planted to screen site of future nursery.
4. Planting 120 azaleas in Japanese Garden.
5. Shrubbery planting at southerly end of esplanade.

6. Shrubbery planting on new border mounds along Flatbush Avenue and the Brighton Beach R. R. cut. (Not yet completed.)
7. Shrubbery planting at Mt. Prospect reservoir gate.
8. Partial transfer of systematic collections, as outlined in my last annual report.
9. Planting box-hedge, about 400 ft., around most of the area of the children's gardens.
10. Initial planting of lilac collection, about 130 varieties.
11. Thinning out local flora shrubbery and using plants in border screen.
12. Moving evergreen decorative planting from site of new greenhouses to Rockery.
13. First plantings in area to be the permanent nursery.
14. Opening up in October of two of the new greenhouses to take care of the new plants received for them. Large additions to the greenhouse fern collections now being studied by Dr. R. C. Benedict, and a gift of 245 plants, mostly cacti, from the New York Botanical Garden, made necessary the rearrangement of some of our old houses and the use of two of the new ones, which were not, however, opened to the public.

In addition to these, two collections of scientific interest were started during the year. The Rock-Garden, occupying the area along Flatbush Avenue, opposite the ecological garden, was planned by Mr. Montague Free, Head Gardener, and constructed and partially planted under his supervision. His account of this work follows.

Rock Garden

By Montague Free

"The construction of the rock garden about 200 ft. long by 50 ft. wide, was carried out by the contractor, Mr. Thomas F. Guidera, under my supervision. After necessary excavations and alterations of grade were made, water pipes were installed and provision made for the carrying of the overflow from the small pool to the sewer. The rocks, consisting mainly of glacial boulders, were then placed in position. Nearly eight hundred

stones, ranging in weight from 50 lbs. to 12 tons were moved. The work commenced on April 10 and was completed by May 6.

"The purpose of a rock garden is primarily to display plants of a saxatile nature and those that are found wild in alpine regions. In practice, however, plants not strictly alpine or saxatile are frequently used in rock gardens, and the practice is permissible under certain circumstances, provided their habit of growth harmonizes with that of the rest of the occupants of the rock garden. The assembling of a large collection of alpine and rock plants is necessarily a process which takes several years, especially in this country, where this class of plants has received but little attention from the commercial growers. It was decided, therefore, in order to furnish the rock garden as quickly as possible, not to limit ourselves to strictly rock plants, but to make use of any suitable subjects that were obtainable.

"Planting commenced on May 9 and about 200 species of plants were installed. Further planting was accomplished throughout the summer, but work in this direction was limited. In the fall about 3,000 bulbs were planted. These consisted mainly of mountain species of *Tulipa, Crocus, Bulbocodium, Chionodoxa, Muscari*, etc., and were planted mainly with a view to determining their adaptability to this climate. The garden is greatly indebted to Mr. Clarence Lown, of Poughkeepsie, N. Y., for the gift of a number of rare alpine plants. About half of the space available in the rock garden still remains to be planted.

"In spite of an exceptionally severe season for Alpines the plants set out in the spring, with one or two exceptions, grew remarkably well, which seems to indicate that the cultivation of certain alpine and rock plants is not an impossibility in this section of the country."

The fern garden, located at the north end of the local flora area, was planned by and constructed under the direction of Dr. R. C. Benedict, resident investigator, whose account of this collection follows:

The Hardy Fern Garden

By R. C. Benedict

"Mention has already been made in the Record (October, 1916, p. 154) of the establishment of the hardy fern garden in coopera-

tion with the American Fern Society. The purposes of the garden are twofold. In the first place it should add an attractive feature to the outdoor collections. Ferns look well almost throughout the year, and a considerable number are evergreen and last throughout the winter. In the second place it will serve as a depository, not only for as representative a collection of hardy ferns as possible, but also as a testing place for desirable ferns which may be introduced and which are not known to be hardy. There is also further value in such a garden in that it will furnish a safe place for rare ferns which might be in danger of extinction owing to changes in the character of communities. For example, many sections of Staten Island, where formerly rare ferns were common, have now become building lots, and agricultural operations in certain parts of the country have also disturbed the haunts of interesting ferns.

"The garden site is a little hillock at the north end of the local flora section. At present it is partly covered with sumac and with a few scattered large trees. Construction plans call for the setting out of a number of tall-growing trees which will furnish the shade generally needed by ferns. The plans also call for a small stream to run around one side of the knoll, emptying into a small pool at the southern side, where the swamp and aquatic ferns can be grown.

"The actual plots where the ferns will be growing are to be made as natural in appearance as possible, logs and rock walls will serve to separate different sections, the rock wall serving also for the kinds which prefer such an environment.

"A beginning on construction has been made covering a portion of the southern end. Several logs have been placed separating part of the slope into small beds or plots. During the fall nearly all the hardy ferns now growing in the gardens were installed in these beds, and all seem likely to thrive. A considerable number of ferns were sent in by members of the American Fern Society in response to a call in the *American Fern Journal* (vol. 6, page 93), some of considerable rarity and interest. A collection of foreign, mainly European, species and varieties was purchased from H. A. Dreer, and given a special bed. The number of different kinds now installed is about seventy-five, and this un-

doubtedly will be considerably added to during the coming season."

Special note should be made of two gifts of plants. In October, through the kindness of Dr. N. L. Britton, the New York Botanical Garden gave us 245 plants, mostly cacti and bromeliads, for the new greenhouses. This collection, from a scientific standpoint, is an important addition. In December, through the kindness of Mr. Henry Hicks, the firm of Isaac Hicks and Son at Westbury gave us about 2,500 shrubs and trees. The large areas to be covered with decorative planting made this one of the most timely gifts ever received by the Garden. A few of the more uncommon species, also, were added to our systematic collections.

Other gifts of plants during the year were as follows: Dr. A. E. Foster, 24; Miss A. V. Luther, 2; A. E. Hyde, 2; Miss E. M. Kittredge, 6; H. Uhrbroch, 1; Parke, Davis Co., 1; Alfred T. White, 3; H. B. Shaw, 2; F. L. Pickett, 1; A. Weeks, 4; L. Webb, 1; Mrs. Walter McDougall, 3; E. W. Brandes, 1; J. B. Todd, 5; W. Voss, C. Moldi, G. Donochod, E. Saring, 1; Brooklyn Park Department, 3; J. Sonderman, 4; H. A. Dreer Co., 1; Botanic Garden of Smith College, 1; Miss Maud H. Purdy, 1.

Our second *Seed List* contained the names of 771 species and varieties of plants, offered in exchange. Nearly 800 packets were sent out, and 159 came into the Garden.

On May 9, 1916, four species of oaks were planted, supplementing the trees already in the local flora section. They were *Quercus alba* (No. 6529), planted by Mr. Alfred T. White, *Quercus velutina* (No. 6522), planted by Mr. A. Augustus Healy, *Quercus coccinea* (No. 6523), planted by Miss Harriet H. White, and *Quercus palustris* (No. 6529), planted by Miss Frances E. White. Two other trees, planted by botanists of note, are *Liriodendron Tulipifera* (No. 4022), planted in 1913 by Adolf Engler, and *Liquidambar styraciflua* (No. 1568), planted by Hugo de Vries in 1912.

Labeling and Other Clerical Work

During the year, verification of plants in the collections has gone on, resulting in the placing of 511 wooden show labels and

FIG. 6. Harvesting the bananas in the economic house, November 6, 1916. The bunch weighed 214 pounds, and contained nearly 300 bananas.

115 lead ones. Construction work has again overshadowed this work, so that the number of verifications made and show labels added have not been as large as could be wished. Accession numbers 6272–7255 inclusive, were assigned during the year. Of course these are only used for the systematic collections and do not therefore reflect the actual additions of plants to the Garden. Rock-Garden plants and all decorative planting are not included. Our records show 3,618 species and forms, and about 1,250 genera grown now in the systematic collections. This does not include 395 specimens without specific names.

Plants in the systematic collections were derived during the year as follows:

By purchase	226
By exchange	185
By gift	337
By collection	137
By seed	72
Total	957

Considerable additions to the local flora section are not included in these figures, which represent only species or forms to which new accession numbers have been assigned.

Phanerogamic Herbarium

Additions to the phanerogamic herbarium have been made as follows: (*a*) Plants mounted and sorted into the cases, 4,271. (*b*) Total number of new specimens received, 2,930. Among the latter, the most important are from the Philippine Islands, 880 specimens; northern New York State, 800; Oklahoma, 250; Jamaica, 175; Long Island, 240; and from the Missouri Botanical Garden 468 specimens from the middle west and southwest. There has been also a good deal of repairing and remounting of old or poorly mounted specimens.

Early in January we received a very large collection from Dr. E. B. Southwick, estimated at 30,000 herbarium specimens and many hundreds of seed samples and sections of woods. For lack of facilities it was impossible properly to arrange and install this collection and it has been held in storage, much of it in the Brooklyn Museum building, until we occupy our completed building.

Special Needs

Vandalism on the grounds has made the keeping of plant labels very difficult. More than 100 were pulled up and scattered, their replacement being next to impossible with any degree of accuracy. I would urge the need, therefore, of a stricter watch and more guards on the grounds.

The statement in my last annual report about the collection of American plants for our living collections is just as true now as a year ago. Again construction work has overshadowed other interests, but for the coming year I trust that at least a start may be made in this work.

Assistance

The accessioning of plants, and their collection in different sections of the Garden has been in charge of Dr. Alfred Gundersen, who has, in part, verified much of this material. He has also done much work on the herbarium, and has from time to time had assistance for this work. He has given a good deal of time to the department of public instruction, especially for the courses on "Spring Flowers and Ferns," and one in the autumn on "Trees and Shrubs," and for much informal instruction.

Gardening and horticultural operations have been in charge of Mr. Montague Free, who has also given a good deal of time to public instruction. Many requests for advice on gardens and insect pests have been answered by him, either through visits to people's gardens or by letter. Mr. Free has taken charge also of the collection of seeds and the preparation of the annual list of seeds offered in exchange.

All of the general maintenance and construction work, other than gardening, has been, as in the past, in charge of the foreman, Mr. Herman Kolsh.

Personal Activities

I have continued my studies on the vegetation of Long Island, but their completion or any publication of them still seems some distance off. I have gone over all the Long Island specimens in the old Brooklyn Institute collections, those from the Long Island

Historical Society, the Julius Bisky collection, the John McCallum collection, as well as many additions from my own field work. There are one or two other collections that should be studied and probably more field work completed before it will be advisable to think of publication.

Identification of many lots of specimens has taken considerable time. One of the largest has been that of Dr. J. Arthur Harris, whose studies for the Carnegie Institution on Osmotic Pressure are based, in part, on Long Island plants. All these, to the number of several hundred, have been identified here.

Outside activities are the same as in my last report to you.

Respectfully submitted,

NORMAN TAYLOR,
Curator of Plants.

REPORT OF THE CURATOR OF PUBLIC INSTRUCTION FOR 1916

DR. C. STUART GAGER, DIRECTOR.

Sir: I have the honor to submit herewith my report as curator of public instruction, for the year ending December 31, 1916.

Courses of Instruction

The regular courses of instruction offered at the Garden are grouped into four classes, as follows:

A. Children's Gardens and Nature Study, including seven courses for children and two for teachers.

B. Courses for Teachers of Children's Gardening, with ten courses. This work, ordinarily requiring a full year, is also repeated during the summer as a concentrated six-weeks' course.

C. Courses for the General Public, consisting of nine courses, treating of gardening and popular botany.

D. Advanced Courses and Investigation, with nine courses, adapted for advanced students, of college or graduate rank.

Our records show a total registration in regular Garden classes,

mostly in group *A*, of 2,614, with a total attendance throughout the year of 14,070. Adding the attendance at these regular classes to that at public lectures given irregularly by members of the staff, both at the Garden and at schools, clubs, etc., the total number of people reached during 1916 in our courses of instruction and lectures has approximated 40,000. The following table shows the attendance by months and the annual totals:

TABLE I

Garden Attendance	Jan.	Feb.	Mar.	Apr.	May	June	July
At regular Garden classes....	366	960	962	733	1,323	1,685	1,668
At visiting classes.....	410	20	194	590	2,638	1,106	0
At public lectures to children	1,600	900	1,000	570	450	85	0
At public lectures to adults	250	314	160	0	0	20	0
At conservatories.....	824	855	1,210	2,473	2,021	1,481	1,060
At grounds	13,628	12,852	12,056	23,180	35,872	42,701	42,012
Total Garden attendance..	17,078	15,901	15,582	27,546	42,304	47,078	44,740
Attendance at addresses at schools, clubs, etc.....	2,500	1,414	1,420	1,720	6,250	1,350	470

Garden Attendance	Aug.	Sept.	Oct.	Nov.	Dec.	Annual Totals
At regular Garden classes....	1,975	1,889	959	1,081	469	14,070
At visiting classes.....	0	660	1,063	1,300	143	8,504
At public lectures to children	0	300	100	1,300	143	6,448
At public lectures to adults	0	0	0	0	0	744
At conservatories.....	1,221	2,792	1,526	1,456	1,271	18,190
At grounds	28,281	30,336	24,461	28,565	21,046	314,990
Total Garden attendance..	31,477	35,977	28,109	32,402	23,072	362,946
Attendance at addresses at schools, clubs, etc.....	0	1,700	1,025	400	200	18,449

As heretofore, the main work in teaching at the Garden has had to do with the popular and practical side of botany and nature study. The work of Miss Shaw and Miss Cross, assisted by others of the teaching and investigating staff, has at times taxed the limited resources of our unfinished laboratory building and greenhouses, as well as our available space assigned to the work with children's gardens out of doors. Under the efficient direction of Miss Shaw, this work has assumed great proportions, touching very closely the work of many of the schools of Brook-

lyn, as well in fact as affecting the teaching of nature study and gardening throughout the entire city. Many teachers have expressed their high appreciation of the help the Garden is thus rendering the schools.

The detailed report of Miss Shaw as curator of elementary instruction is appended below.

I have also appended a brief summary of the work of Mr. Frank Stoll with Boy Scouts, Camp Fire Girls and similar organizations. With the further development of this plan, there is scarcely any limit to the good work in nature study, elementary forestry, gardening and agriculture which the Garden might be able to do.

Cooperation with Local Schools

Talks at Schools.—Our records show 68 talks and lectures by various members of the staff, given at schools, both public and private, with a total attendance of over 18,000.

School Classes at the Garden.—During the year, 157 classes, mostly from elementary schools, visited the Garden, all of them receiving special guidance and instruction in their trips through the conservatories and plantations. In addition, nearly all of these classes had a lantern talk on a subject chosen by the teacher, from lists prepared by Miss Shaw, both for spring and fall lectures. Our limited space often made it necessary to divide the large classes and to repeat the lecture once or even twice. In this way, at least 300 special lectures to these visiting classes have been given.

As heretofore, several of the high schools and colleges availed themselves of the opportunity to utilize the Garden in various ways. During the Teachers' Institute which preceded the opening of the schools to pupils, many groups of teachers came to the Garden to learn of our work and to study various features of it. Among the institutions which thus availed themselves of the opportunity were the Brooklyn Teachers' Training School, Erasmus Hall High School, and Boys' High School. About 75 delegates, one from each school in Miss Strachan's districts, Nos. 33 and 35, came for a two-hour lesson on nature study every day during the duration of the Teachers' Institute.

Under the direction of their teacher, Dr. Ralph C. Benedict, classes from the Bushwick High School have been coming to the Garden several afternoons a week since October for special instruction in greenhouse work and nature study. Also, representatives of the Science Club, from Boys' High School, have been having special courses in tree study since October 26.

Study and Loan Material.—Study material of various kinds has been furnished during the year to Packer Collegiate Institute, Adelphi College, Erasmus Hall High School, Girls' High School, and others. Petri dishes, filled with sterile nutrient agar, for the study of bacteria and molds, have been prepared by the Garden for the Brooklyn Training School and for various High Schools, including Eastern District, Erasmus Hall, Girls' High, Manual Training High and Annex. We have also tentatively inaugurated the practice of loaning lantern slides. Teachers assure us that the further encouragement of this practice promises to help them materially in their teaching.

Recommendations

Nature Study for Boy Scouts, Camp Fire Girls and Similar Organizations.—With a somewhat increased support of this important work which the Garden inaugurated a little over a year ago, undoubtedly a great field can be opened up for further work. With our splendid Parks and Botanic Garden to draw upon for material, we are seeking to overcome in large part the handicap experienced by the city boy and girl in their contact with the fascinating objects of nature. Possibly some of these organizations themselves may see their way clear to contribute financial support toward this important work and thus help materially to advance more rapidly their own important aims.

Nature Study in the School.—If the teaching of nature study in the schools could somehow be associated more intimately with the work at the Garden, some plan might be worked out whereby material, now conspicuously lacking or at least difficult for the teacher to obtain, might be made more readily available to schools. Classes can at least be sent oftener to the Garden where the material is more easy of access.

Consulting Plant Pathologist.—Another matter looking toward

the greater usefulness of the Garden in the community is the application of expert knowledge toward the solution of certain problems connected with the diseases of park and city trees and shrubs. The Garden has been much interested in the prevalence and in the economic importance of plant diseases found in the vicinity, and has freely given advice on these matters whenever called upon. We are now engaged in carrying out a plan whereby we hope soon to be in a much better position to give expert advice along these important lines. We have been fortunate in having during the past summer the services of Prof. George M. Reed, of the University of Missouri, who has been studying the diseases found in Prospect Park and the Garden. A continuation of this highly practical and important work will in time give us a fund of information which will be invaluable to the Park authorities as well as to other citizens. I would therefore suggest the making of some sort of arrangement whereby a member of the Garden staff could, as consulting plant pathologist, give expert opinion as needed on the spraying of the trees of city Parks and streets and on the general treatment of plant diseases.

*The Block Park Garden.**—"One cannot do home visiting in the crowded tenement districts of Williamsburg, and other sections, without noticing how much space which might be available for gardens, is unused. Looking out of a rear window one sees two rows of tiny back yards each with a high board fence around it. Sometimes there are as many as 30 or 40 yards, a quarter of an acre or more of unused space to a square block!—space unused except as a catch-all with a few weeds struggling for existence. And this waste in an overcrowded district, where the children have no playground but the streets!

"For several years we have tried to help the children turn these back yards into gardens. It has been a struggle, and with the exception of a few instances not very successful. The difficulties are too great—the child is willing and anxious to clean out the old bricks, tin cans, shoes, etc., but an uninterested real estate agent will not have the trash carted off, so the child cleans the ground as best he can and leaves the waste in a pile. Another

* Written by Miss Jean Cross, assistant curator of elementary instruction.

obstacle presents itself—the tiny back yard does not belong to one boy or even to one family but must be shared by all the dwellers of the tenement and Johnnie's space dwindles down to perhaps only room for a hill of corn; and then the high board fence keeps out the sun. We have been saying that even one bean plant or one hill of corn is worth while, but how much more worth while if, by concentrated efforts, all those back fences could be torn down and a Block Park Garden could be established. There could be the grass plot in the center where children could play, borders of flowers cared for by the children of the block, settees for tired mothers and babies, and a resting place for working men in the evening.

"An arc light would be a great asset. Block Park Gardens surely would help solve the tenement problem, for they mean a breathing space to each block, and keeping the children off the streets."

Cryptogamic Herbarium

The following accessions were made to the cryptogamic herbarium during 1916:

Lichens, by gift from Mr. R. Heber Howe, Concord, Mass.	10
Lichens, by gift from Miss Mary Chambers, Graniteville, S. C.	1
Mosses and liverworts, by gift from Prof. H. H. Whetzel, Cornell University	25
Algae, by purchase	100
Fungi, by purchase	1,130
Fungi, by collection	790
Fungi, by gift from Mr. F. H. Ames, Brooklyn	45
Fungi, by gift from Miss Gertrude Burlingham, Brooklyn	182
Fungi, by gift from Mr. C. Schwarze, Agri. Exp. Sta., New Brunswick, N. J.	10
Total	2,293

Editorial and Research Work, Etc.

As heretofore, I have acted as editor of the *Leaflets,* and as one of the board of editors of the *American Journal of Botany.*

In Series IV, the fourth year of the *Leaflets,* fourteen numbers were issued. Their popularity is attested by the fact that

the demand for certain of the numbers has entirely exhausted our comparatively large issue. We have reached the time when more adequate financial support must be available in order to supply the demands made by the public. It may be found necessary to make a charge for the *Leaflets* to all but members of the Garden and teachers; in my opinion, a deplorable possibility.

Miss Shaw, the curator of elementary instruction, continued to serve throughout the year as managing editor of the *National Plant, Flower and Fruit Guild Magazine;* and editor of the Children's Garden Department of the *Garden Magazine,* until October, 1916; and of the Nature Club of *Country Life in America* until June, 1916, when pressure of other duties compelled her to relinquish this congenial work. Miss Cross has served as recording secretary, and Miss Shaw as one of the Board of Managers, of the Woman's Farm and Garden Association.

My research work has had to do largely with certain diseases of plants, especially the rusts. I was away on leave of absence from February 19 till May 1, 1916, collecting and studying the fungi and plant diseases of Porto Rico. A report of this trip was published in the Botanic Garden RECORD for July, 1916.

Special reports by the curator of elementary instruction and by Mr. Stoll are appended hereto.

Respectfully submitted,

EDGAR W. OLIVE,
Curator of Public Instruction.

Report on Elementary Instruction

BY ELLEN EDDY SHAW

In the report of the work in elementary instruction for 1915 emphasis was laid on three natural divisions of this work, viz., children's class work, cooperation with schools, and instruction for teachers. These are the three lines that have been emphasized during this year, and the progress made forms the foundation for this report.

Courses for Children

The children's classwork has increased so that there were nearly five times as many children registered this year as last;

FIG. 7. Children's garden work. Corn culture, as a special problem for the silver pin. September 2, 1916.

the total registration being about 2,000, against 400 of last year. The cause for this increase may be accounted for, not on the grounds of interest alone but of greater assistance in teaching. This figure may be increased several times with the added space of the new building. The children's class work refers only to the work done in the greenhouse and classroom with children in small groups of from fifteen to twenty members *all of whom came entirely of their own volition.* The greater number of these children register weeks ahead for class work, quite independent of suggestions from their teachers. In some cases arrangements have been made by principals and special teachers for children from their schools. P. S. 89, the Gary School nearest the Garden, makes constant use of our facilities for regular class work; while schools far removed from us, as P. S. 148 and 36, each season arrange for their children to have classes after school. These classes are used as practice classes for the young women taking our teachers' course. It might be of interest to add here this statement: *It is very rare that a child, who comes to the Garden, takes one short course only. He usually registers for other courses in succession until he becomes an independent worker in certain phases of Garden work.* The curriculum is so arranged that the courses build up, one after the other, to form a larger unit with a definite sum total of botanical and garden knowledge. The Boys' and Girls' Clubs, numbering 500 and 400 each, are spontaneous outgrowths from this class work. The highest achievement in these clubs is the work for silver buttons: this work covers at least six months of time and is, in a small way, independent in nature. Eight boys and five girls received their silver buttons this year. About twenty other boys and six girls are at present working on special topics with his end in view.

The registration figure for the outdoor garden was 200 in April; this dropped to 125 in July on account of infantile paralysis, so prevalent in Brooklyn. The drop was due to no special feeling of danger for the child at the Garden, but because of the necessity of travel on congested trolley lines. The children's gardens this year were on our new and permanent site. Because of the poor condition of the soil, and the extra ground needed by the builders erecting the children's house, it was thought best to

lay out the grounds temporarily and leave the final plans until our grounds were in permanent shape. And so the arrangement of garden plots was planned primarily to accommodate the greatest number of children rather than for the best educational results.

Courses for Teachers of Children's Gardening

It might be well here to consider our work in the instruction of garden teachers. On July 5, 1916, the first regular summer session in this work was started. There were ten students in the course. In order that these students should have the best possible practice it was necessary to lay out a piece of ground for children's gardens. Our garden plots for children had been laid out in May, and no space was available in the children's garden proper without digging up a sufficient number of these plots to accommodate the pupil teachers. To avoid this a small piece of unplanted ground near the children's gardens was loaned us for the season and a new garden was laid out. A new set of children came to us, and the teachers had their own gardens also on this area. The session closed August 15. Four students remained voluntarily to work until September first. This summer session is to be repeated in the summer of 1917.

On Saturday afternoon, December 9, 1916, certificates in Children's Gardening were conferred on a class of thirteen women who had completed the course for the preparation of teachers of children's gardening. An address on "The Larger Setting of Nature Study" was given by Dr. Thomas Balliet, Dean of the School of Pedagogy of New York University. After the conferring of certificates, the class of 1915, represented by Miss Maud E. Snedeker, presented the Garden with a beautiful bird bath for the children's gardens. The gift was accepted by Mr. Alfred T. White, chairman of the Botanic Garden Governing Committee of the board of trustees. At the close of the formal exercises tea was served by the Garden Teachers' Association of the Brooklyn Botanic Garden.

Cooperation with Schools

School lecture courses were planned, one for the spring of 1916, and one for the following fall. The subject matter correlates

with the geography and nature study courses of the elementary schools. Over 8,500 children attended these lectures, a large increase over the attendance of last year. Lectures to children on other subjects had an attendance of 6,448, while over 18,000 were reached by lectures at schools and clubs. These numbers, especially for the lectures at the Garden, could be greatly increased if the work was conducted on a different, but educationally less profitable, basis. The classes coming to the Botanic Garden are divided into small groups, so that each child may receive personal attention and direct teaching. In this way much more time is consumed than in the more usual method of handling larger groups as a unit.

Assistance in Home Gardening.—We selected three districts for this work during the past summer: the tenement district in the vicinity of P. S. 43, near Willliamsburg Bridge; near P. S. 89 in the Flatbush district; and in the vicinity of P. S. 98 in the Sheepshead Bay district. 30 to 40 gardens were visited in each district, some of them many times by the student teachers who are taking our course for Teachers of Children's Gardens. Although the work was much interrupted by the epidemic of infant paralysis, this method of specializing on certain districts proved more satisfactory in some respects than the plan of general, unsystematic visits to gardens throughout the city.

As noted in previous reports, the department of elementary education puts up penny packets of seeds for the Brooklyn boys and girls; 25,000 packets were distributed in 1914; 85,600 in 1915; and 112,000 in 1916. Our annual children's horticultural exhibit was held September 29 and 30. Because of the sickness in the summer and the late opening of school, it was thought that the exhibit would be far inferior to that of 1915. But, while the number of exhibitors was not much greater than that of the preceding year, the quality of the exhibit was far better. P. S. 152 again won the first prize in Class A for the best general exhibit and received the Bronze Trophy of Victory, now their property, having been won three times by that school. The exhibit in Class B, the best Box Exhibit, which won first prize, should be spoken of. This was the work of P. S. 43. The exhibit covered one side of the exhibition room. The number of exhibits was not the main

feature, but rather the story back of it. For these pots, pails and boxes of plants were raised in one of the most crowded sections of Brooklyn, raised by boys and girls who have for the most part only indoor sills and fire escapes for garden plots. The exhibits of the Park Department Gardens for children were most commendable for their quality of flowers and vegetables exhibited.

The Garden Teachers' Association of the Brooklyn Botanic Garden, as usual, presented a cup as a trophy to the boy or girl doing the best work at the Brooklyn Botanic Garden for more than one season. This cup was won by Gladys Bergman, of P. S. 9. The prizes were awarded October 14, by Mr. Eugene Dailledouze of Brooklyn.

The points in the work of the department of elementary instruction in 1916 to be specially noted are the following: the increase in numbers in the children's garden classes; the increase in use of the Garden by the elementary teachers; the superior quality of work done by children in their own gardens, as shown by our exhibit; and the summer session of our Garden Teachers' Course.

Report on Work in Nature Study for Boy Scouts, Camp Fire Girls and Others

By Frank Stoll

A little more than one year has elapsed since the Brooklyn Botanic Garden first offered courses to suit the needs of Boy Scouts, Camp Fire Girls, and similar organizations. The first classes met on October 16, 1915. Since that time 577 individual members of these organizations have availed themselves of the opportunity of instruction at the Garden, with a total attendance of 1,090. 44 different troops or groups have been thus represented.

My connections as Scoutmaster of Troop No. 50, B. S. A., and as Deputy District Commissioner of Flatbush, also my appointment by the Brooklyn Council as expert examiner in several scout subjects, have brought me in close personal touch with the Boy Scout organization of our city and have in turn helped to acquaint the organizations with their opportunities here at the Garden.

The following running account of my personal activities in this work during the past year, carried on in addition to my other duties at the Garden, will best indicate our methods of co-operation in this important movement. Two holiday hikes, on February 12 and May 30, were given to the scouts of troop 50, of which I at that time served as scoutmaster. On the former date the party, including 12 boys, spent the day in the woods at Rosedale, L. I. Six scout tests were passed. On the latter date, 14 boys accompanied me to Van Cortlandt Park, where the entire day was spent in the beautiful open country along the aqueduct. There, in the natural state, we studied a great variety of trees, shrubs, and flowers. Eight scout tests were passed.

On June 10, in a scoutmasters' hike to the camp of Ernest Thompson-Seton, at Greenwich, Conn., I conducted a field trip of two hours for the study of trees, accompanied by 15 Brooklyn scoutmasters and officials, who showed keen interest in the subject.

On July 4, ten members of the Inkowa Club were instructed in trees and shrubs in Prospect Park and the Brooklyn Botanic Garden. To this club of men and women I had given in February and March, at the American Museum of Natural History, in Manhattan, a course of four lectures on identification of our common trees. There was an approximate aggregate attendance of 100 members.

On July 7–9 I visited Camp Midwout, near Tuxedo, N. Y. This is the Boy Scout Camp of Flatbush District, Brooklyn. There were at the time 55 boys in camp. We had two field trips for the study of trees and shrubs. Fourteen boys passed first-class test No. 10, in nature study and stars.

July 18–21, under the auspices of the Woodcraft League of New York City, I visited a chain of four camps in northern Connecticut and eastern New York, viz., Camp Pootatuck, South Kent, Conn.; Bridgeport Y. M. C. A.; Camp Kowannun at Twin Lakes, Conn.; Stamford Y. M. C. A.; Camp Wa Wa Segowea, Ancram, N. Y.; Poughkeepsie Y. M. C. A.; and Camp Wake Robin, a private camp at Woodland, N. Y. Two talks were given at each camp, and about 400 altogether attended.

I spent my vacation in my own camp, Camp Alsacia, Layton, Sussex Co., N. J., where three first class scouts spent the month

of August. Daily instruction was given in nature study, scout-craft and woodcraft.

On October 12 I accompanied a party consisting of 150 scouts and 10 scoutmasters from Flatbush District to Staten Island, when one hour's instruction was given in nature study.

On December 29 I conducted several members and friends of the Natural Science Club of Boys' High School on a trip through Van Cortlandt Park, and the woods along the aqueduct beyond, for the purpose of studying and collecting twigs and fruits of trees and shrubs.

These outside activities in nature study instruction form but a small part of the assistance to Boy Scouts, Camp Fire Girls, and other groups, which we are undertaking. One or more classes, in groups ranging from 6 to 20, have been held almost daily at the Garden throughout the school year. The pupils are taught, by outdoor study as well as indoors, to recognize and to become familiar with the principal trees, shrubs, and wild flowers.

Specimens of leaves, twigs, flowers, and fruit are collected, mounted, and labeled. These mounts become the pupil's own property, and together with the notes taken in class and on field trips, constitute the basis for a Garden certificate in tree study.

In the aggregate I have personally instructed 834 individuals, with an attendance of 1,759.

The work reported above for holidays and during the summer months is exclusive of the regular Garden classes with which I assisted, and which are fully reported by Miss Shaw, curator of elementary instruction.

REPORT OF THE LIBRARIAN FOR 1916

DR. C. STUART GAGER, DIRECTOR.

Sir: I have the honor to submit the following report for the year ending December 31, 1916.

The position of librarian at the Brooklyn Botanic Garden was assumed by me in September, 1916. The greatest need to a newcomer, unfamiliar with the highly specialized botanical literature, was a catalogue or finding-list. Therefore, every effort has been

put forth since my arrival to have each volume represented in the catalogue. Up to the present time approximately 1,700 volumes have been catalogued. It is my desire to complete at least the book collection catalogue (as distinct from the back serial publications), before we enter the new building. The folio volumes, the books on evolution, those in the herbarium, and all the books out in circulation, have not yet been examined for cataloguing.

Several members of the staff have suggested that, if possible, the catalogue be simplified. This idea has been kept in mind, the necessary information being typed in such form as to be easily understood by anyone consulting the catalogue.

Reclassification

With the aid of the various members of the staff, changes have been made in the classification which would more satisfactorily meet their needs. The headings have been made more general in character, and broad enough to include the smaller groups, which had heretofore received separate classification numbers.

Subject Headings

We have finished a subject heading file for the private use of the librarian when cataloguing, so that one can always be certain of using the heading which has already been used—provided it is the correct one—with the proper cross references, if necessary. This file is constantly being enlarged as new subject headings and cross references are made. No cards are added to the catalogue before the subject cards are compared with this file.

Binding

During the year 1916, from the records consulted, 155 publications were bound, mainly periodicals. Over 400 volumes are now ready for the binder as soon as funds for binding become available.

Accessions

Among the large accessions added to the library during 1916 by purchase may be mentioned the volumes of the *Comptes*

Rendus, de l'Académie des Sciences de Paris, in cloth, covering the years 1904, and 1906–1913, in seven volumes; *Zeitschrift für Pflanzenkrankheiten,* in cloth, 1908–1912, in five volumes; *Berichte der Deutschen botanischen Gesellschaft,* beginning with 1883 through 1909, in one-half morocco, in twenty-six volumes, and for 1910–1912 in paper-covered numbers; the *Encyclopaedia Britannica,* Handy Volume Issue, 11th edition, in library buckrum, in twenty-nine volumes; *Proceedings of the Society for Horticultural Science,* cloth bound, eleven volumes, covering the period 1903–1914; *Bailey's Standard Cyclopaedia of Horticulture,* new edition, four volumes.

Gifts

The large gifts of the year have been received from Mrs. Clarence R. Hyde, seventy-four volumes; fourteen volumes from the Long Island Historical Society Library; other gifts were received as follows: Vinton's Address at the Inauguration of the Hunt Botanical Garden in Brooklyn, N. Y., 1855; Report on the Work of the Agricultural Experiment Stations, 1914, from the United States Department of Agriculture; Pammel's Major John F. Lacy, Memorial Volume; Report of the 15th Expedition of the Harvard School of Tropical Medicine to South America; Stuart's Voorbereidende Onderzoekingen ten Dienste van de Selektie der Theeplant; Annual Report of the Smithsonian Institution, 1915; Murrill's Edible and Poisonous Mushrooms; Rogers' Introduction to the Study of South Australian Orchids; Robbins' Ethnobotany of the Tewa Indians; Rio de Janeiro, Jardim Botanico Archivos; Cook's Economic Plants of Porto Rico. A complete list of donors is given below (pp. 77–79).

While there have not been as many volumes received through exchange, we may enumerate the Massachusetts Agricultural Experiment Station, Annual Reports, covering the years 1908–15; American Philosophical Society, Proceedings, 1914–15, as well as the General Index for volumes 1–50, 1838–1911; Ottawa, Canada, Dominion Experimental Farms, Reports from the Various Divisions; New York Zoological Society, Annual Reports for 1915, and from the New York State Library, thirty volumes of the New York State botanist's reports, from the first volume begin-

ning with 1867 to 1915, lacking but one volume to complete the set. This missing volume, No. 40, for 1886, is being advertised for in the "Want Columns" of the American Library Association Bulletin, which reaches the desk of every library in the country. There is, therefore, a very good chance of filling this gap in the set.

The total number of volumes in the Brooklyn Botanic Garden Library on December 31, 1916, was 4,371. A word of explanation is necessary in order to account for the discrepancy between the last number in the accession book, 3,527, and the number of volumes said to be in the library, 4,371. This is due to the fact that the incorporation, as an integral part of our library, of the books transferred from the Brooklyn Museum in November, 1913, to the Botanic Garden, and numbering between eight and nine hundred, was authorized only last fall, and they have not yet been accessioned.

The total number of volumes and pamphlets on December 31, 1916, was 11,193, as compared with 9,689 on December 31, 1915 —an increase of 1,504 items—for the year.

Periodicals

Copies of the "List of Current Periodicals on File in the Brooklyn Botanic Garden Library," prepared by my predecessor, Dr. Laura E. W. Benedict, and reprinted from the Botanic Garden RECORD, for October, 1916, were sent to the libraries of the American Museum of Natural History, New York Botanical Garden, Columbia University, New York, and Northwestern Universities, and to the New York Public Library; to the Brooklyn Museum, Children's Museum of Brooklyn, the John Crerar library, the Brooklyn Public Library, Main Branch, as well as to the Reference Department, and to the Bedford, Prospect, and Williamsburg Branches of the Brooklyn Public Library.

Thirty-four new periodicals have been added to the library. This makes a total of two hundred fifty-eight current periodicals received at the Garden, through subscription, exchange, gift, transfer, deposit, and publication, through which were received 2,093 parts of current periodicals during the last year. Some of the additions are: *Addisonia,* Alaska Agricultural Experiment

Station; Canada, Department of Agriculture, including the Divisions of Horticulture, Botany and Entomology; *Eugenical News; Genetics;* Illinois Agricultural Experiment Station; India, United Provinces of Agra and Oudh, Dhahjajanpur; Pennsylvania Museum and School of Industrial Art; United States National Herbarium, Contributions; Bulletin of the Jardin Botanique, Buitenzorg, Java.

All the foreign periodicals have been received regularly during the past year, except those printed in the German language. We did, however, forward to the Library of Congress an "Application for a Permit" to ship the periodicals held at Leipzig. This application has been approved by Mr. Putnam, librarian of the Congressional Library, and forwarded to the Department of State for transmission to the British authorities. No applications for any but back numbers of periodicals are at present being accepted.

State Publications

Idaho; Iowa; Maine, Department of Agriculture, as distinct from the Agricultural Experiment Station; North Carolina Geological and Economic Survey; West Virginia Agricultural Experiment Station, have been added to the list of states from which we are to receive literature as issued by them, thus making a total of fifty-one state sources. Correspondence with agricultural experiment stations from which we have not received literature for some time has brought new publications from those states, and in this way we have filled in the numerous gaps. Invariably the stations are very generous, providing the missing numbers are still in print. Both the state institutions, the United States Department of Agriculture and allied departments have shown a splendid spirit in their cooperation with institution libraries such as the Garden's.

From the records on file, it is shown that 12,157 volumes, pamphlets, and parts, exclusive of current periodicals, were received and handled, as well as 2,093 parts of current periodicals, which had to be recorded, taken care of, and shelved.

Since September 20, when the present librarian entered upon her duties, the following work, aside from routine, has been carried on with the aid of Miss Tikiob and Miss Mann:

Reclassifying and reshelf-listing, as well as renumbering the backs of books. In all about 1,700 volumes were handled in this process. It has not yet been completed.

The typing and filing of 2,706 catalogue, shelf-list, pamphlet and current periodical cards, and the filing of 608 printed cards. These numbers include shelf-list, catalogue, Torrey Club, and Experiment Station literature cards. The classification has been partly worked over, but not as yet completed, and subject heading file completed.

The classified section of the Annie Morrill Smith collection has been catalogued, and each book marked with the letter "S" above the call number, pamphlets have been put into Gaylord binders as they came into the library, and U. S. Dept. of Agriculture, Farmers' Bulletins arranged and tied into bundles with labels. Correspondence has been carried on regarding the filling in of missing numbers from experiment stations already on our list, and creating new exchanges with the states not in our file.

Library Assistants

Miss Tikiob has typed the current periodical and pamphlet cards, placed the pamphlets into binders, arranged Farmers' Bulletins, has typewritten the Subject Heading List, and cut pages, besides her regular stenographic work for the library.

Miss Mann has typed shelf-list and catalogue cards and filed them; numbered the backs of books, cut pages, and cared for the current periodical cases.

1917

For the contemplated work of the next year, it would be well to have a full-time assistant for this department. My predecessor, Dr. Laura E. W. Benedict, accomplished a tremendous task which is much appreciated by the present librarian, but there is still a great abundance of work to be done in simply bringing the work up to the standard so far as business records are concerned, not to speak of other work which may be projected and accomplished in a library for the convenience of its patrons. The following is an outline of the work most important at the present time:

1. Completing the revision of the classification.
2. The binding of periodicals and books.
3. Completion of the dictionary catalogue.
4. Comparison of shelf-list with dictionary catalogue, so that we may find missing volumes and catalogue them, as well as weed out dead cards.
5. Accessioning between eight and nine hundred books which were transferred to us by the Museum, and which have never been given our accession numbers. These have now been turned over to us permanently, and should, therefore, be entered in the accession book.
6. Revising and completing the back serial shelf-list and catalogue, so that we may know what years and volumes of sets of periodicals, society transactions and proceedings, and annual reports of institutions we actually possess, and what years are lacking.
7. Cataloguing of duplicates.

I wish to extend to each member of the Garden staff my keen appreciation of the aid extended to me in every way possible during the past few months.

The statistical report and the list of donors is herewith attached.

Respectfully submitted,

RAY SIMPSON,
Librarian.

STATISTICAL REPORT ON THE LIBRARY

Accessions during 1916

	Volumes	Pamphlets	Parts (not including periodicals)	Maps	Plates
By purchase	339	25	10	0	0
By gift	189	374	376	1	1
By exchange	39	474	557	0	0
By publication	0	64	19	0	0
	567	937	962	1	1

Total of publications added to the library in 1916, exclusive of current periodicals	2,468
Total number of parts of current periodicals received in 1916	2,093

Grand total of new publications received in 1916, including current issues of serials	4,561
Total number of volumes in the library, December 31, 1915	3,804
Volumes added in 1916	567
Total number of volumes in the library, December 31, 1916	4,371
Total number of pamphlets in the library, December 31, 1915 (approximate count)	5,885
Pamphlets added in 1916	937
Total number of pamphlets in the library, December 31, 1916 (approximate count)	6,822
Total number of volumes and pamphlets in the library, December 31, 1916	11,193
Total number of volumes and pamphlets in the library, December 31, 1915	9,689
Increase in number of volumes and pamphlets	1,504

Serial Publications

Count of periodicals, state and government documents, and society transactions currently received during 1916:

By subscription	28
By gift	29
By exchange	194
By transfer from Brooklyn Museum	1
By deposit from the Brooklyn Public Library	2
By publication	4
Total	258
Increase during 1916	34

Miscellaneous Statistics for 1916

Index cards of the United States Experiment Stations on file in the library, December 31, 1915	6,190
Experiment Stations index cards added by purchase in 1916	212
Total number of Experiment Stations index cards on file in the library, December 31, 1916	6,402
Torrey Botanical Club index cards on file in the library, December 31, 1915	22,973
Torrey Botanical Club index cards added by purchase during 1916	1,206
Total number of Torrey Botanical Club index cards on file December 31, 1916	24,179

Total number of Index algarum universalis, issues 1–4, December 31, 1915	2,400
Index algarum universalis cards added by purchase in 1916	3,396
Total number of Index algarum universalis cards, December 31, 1916	5,796
Photographic negatives on file December 31, 1915	1,857
Negatives accessioned in 1916	217
Total number of negatives on file December 31, 1916	2,074
Lantern slides on file December 31, 1915	1,645
Lantern slides accessioned in 1916	24
Total number of lantern slides on file December 31, 1916	1,009
Volumes entered in Accession Book	567
Volumes classified, reclassified, shelf-listed, and reshelf-listed, approximately	1,700
Cards added to the shelf list	307
Cards added to the dictionary catalogue	3,349
Cards added to pamphlet catalogue	1,328
Cards added to current periodical catalogue	34
Books loaned to members of Garden staff	247
Number of readers in the library, approximately	1,438
Number of letters written, approximately	241

Donations, 1916

Donors	Books	Pamphlets
American Museum of Natural History, New York City	1	
American Scenic and Historic Preservation Society, New York City	2	
Armstrong Cork Company, Pittsburgh, Pa.		1
Bailey, L. H., Ithaca, N. Y.	1	
Botanische Anstalt, Basel, Switzerland		1
Botanische Garten u. Museum, Dahlem, Berlin, Germany		1
Boerker, R. H., Lincoln, Neb.	1	
Bridgman, H. L., Brooklyn, N. Y.	1	
Britton, E. G., New York City		1
Brooklyn Museum, Brooklyn, N. Y.	3	14
Brooklyn Trust Company, Brooklyn, N. Y.		1
California, University of, Berkeley, Calif.		1
Canada, Department of Agriculture, Ottawa	2	
Canada, Department of Interior, Ottawa		1
Canadian Forestry Association, Ottawa		1
Canadian Seed Growers' Association, Ottawa	1	
Carnegie Institution of Washington, Washington, D. C.	1	
Columbia University, New York City	1	1
Connecticut Agricultural Experiment Station, New Haven	1	

Cornell University, Ithaca, N. Y.		2
Free, Montague, Brooklyn, N. Y.	1	1
Freer, James A., Washington, D. C.		1
Gager, C. Stuart, Brooklyn, N. Y.	15	45
Gundersen, Dr. A., Brooklyn, N. Y.		2
Harvard University, Cambridge, Mass.		1
Hongkong Botanical and Forestry Department		1
Hyde, Mrs. Clarence R., Brooklyn, N. Y.	74	
Ingersoll, Raymond V., Brooklyn, N. Y.	1	
John Crerar Library, Chicago, Ill.		1
Letkemann, H. V., New York	1	
Lloyd, C. G., Cincinnati, O.		2
Long Island Historical Society, Brooklyn, N. Y.	19	13
Lucknow, India, Government Horticultural Gardens		1
Massachusetts Horticultural Society, Boston, Mass.	1	
Massachusetts State Forester, Boston, Mass.	2	
Missouri, University of, Columbia		2
Montana Agricultural Experiment Station, Bozeman		5
Nelson, Aven. University of Wyoming, Laramie, Wyo.		3
New Jersey Department of Conservation, Trenton, N. J.	1	
New York State Library, Albany, N. Y.	30	
New York, College of the City of	1	
New York City, Department of Health		1
National Educators' Conservation Society, New York City		1
New York Academy of Sciences, New York City		1
Olive, Dr. E. W., Brooklyn, N. Y.	1	
Osterhout, W. J. V., Cambridge, Mass.		5
Pammel, Prof. L. H., Ames, Iowa	1	
Pennsylvania Museum, Philadelphia		1
Pennsylvania State College, State College, Pa.	2	
Philippine Islands, Bureau of Forestry, Manila	1	
Princeton University Press, Princeton, N. J.		1
Rio de Janeiro, Jardim de Botanico	2	
Sacramento, Cal., Superintendent of Public Instruction	1	
Seaver, B. F., New York City	1	
School Garden Association of America, New York City		1
School of Horticulture for Women, Ambler, Pa.		4
Smith, Mrs. Annie Morrill, Brooklyn, N. Y.	3	15
Smithsonian Institution, Washington, D. C.	1	
Society of American Florists, Beacon, N. Y.		1
Taylor, Norman, Brooklyn, N. Y.	1	
United States Brewers' Association, New York City	1	
United States Bureau of Education, Washington, D. C.	2	
U. S. Dept. of Agriculture, Washington, D. C.	1	184
U. S. D. A., Bureau of Soils, Washington, D. C.		1
U. S. D. A., Division of Publications, Washington, D. C.	3	11

U. S. D. A., Department of Plant Pathology, Washington, D. C.		4
U. S. D. A., Federal Horticultural Board, Washington, D. C.		1
U. S. D. A., Journal of Agricultural Research, Washington, D. C.		35
U. S. Dept. of Commerce, Washington, D. C.		1
U. S. Dept. of the Interior, Washington, D. C.	1	
U. S. Geological Survey, Washington, D. C.	2	
U. S. National Museum, Washington, D. C.	2	
Untermyer, Samuel, New York City		1
Utrecht, Netherlands, Hortus Botanicus Rijks Universiteit	1	
West India Gardens, Altadena, California		1
White, A. T., Brooklyn, N. Y.	1	
Wieland, Prof. G. R., New Haven, Conn.		1
	189	374

FINANCIAL STATEMENTS FOR 1916

1. Municipal Account

1360 *Personal Service:*

Appropriation		$29,860.00
Contributed from private funds		3,974.49
		33,834.49
Expended		33,834.49

1361 *Supplies:*

Appropriation		$ 4,382.00
Transferred from 1362	$ 37.16	
Transferred from 1363	88.81	
Transferred from 1364	105.75	
Transferred from 1365	37.07	
Transferred from 1368	89.47	
Transferred from 1369	42.36	
Transferred from 1370	54.48	455.10
		4,837.10
Expended		4,837.10

1362 *Purchase of Equipment:*

Appropriation	$ 1,430.00
Transferred to 1361	37.16
	1,392.84
Expended	1,392.84

1363	*Materials:*		
	Appropriation	$	378.60
	Transferred to 1361		88.81
			289.79
	Expended		289.79
1364	*General Repairs:*		
	Appropriation	$	660.00
	Transferred to 1361		105.75
			554.25
	Expended		554.25
1365	*Light, Heat and Power:*		
	Appropriation	$	100.00
	Transferred to 1361		37.07
			62.93
	Expended		62.93
1366	*Hire of Horses and Vehicles with Drivers:*		
	Appropriation	$	45.00
	Expended		45.00
1367	*Hire of Horses and Vehicles without Drivers:*		
	Appropriation	$	454.50
	Contributed from private funds		121.94
			576.44
	Expended		576.44
1368	*Expressage and Deliveries:*		
	Appropriation	$	325.00
	Transferred to 1361		89.47
			235.53
	Expended		235.53
1369	*Communication:*		
	Appropriation	$	150.00
	Transferred to 1361		42.36
			107.64
	Expended		107.63
	Balance, December 31, 1916	$	.01
1370	*Contingencies:*		
	Appropriation	$	350.00
	Transferred to 1361		54.48
			295.52
	Expended		295.52

Summary of Municipal Account:

Appropriation by city for maintenance	$38,135.10
Contributed from private funds	4,096.43
	42,231.53
Expended	42,231.52
Balance, December 31, 1916	$ .01

2. Private Funds Accounts for 1916

1. *Endowment Fund, Income:*

Balance, January 1, 1916	$ 124.22
Income, 1916	3,302.79
	3,427.01
Expended	3,879.64
Deficit, December 31, 1916	$ 452.63

2. *Botanic Garden Collections Fund, 1916:*

Received, 1916		$ 4,440.00
Transferred to Special Contributions	$2,342.99	
Expended	2,097.01	4,440.00

3. *Special Contributions:*

Balance, January 1, 1916		$ 9.72
Received, 1916		2,300.00
Contributed from Collections (1916) Fund		2,342.99
Contributed to maintenance account	$4,096.43	4,652.71
Expended	556.28	4,652.71

4. *Cary Library Fund, Income:*

Balance, January 1, 1916	$ 77.75
Income, 1916	100.00
	177.75
Expended	115.62
Balance, December 31, 1916	$ 62.13

5. *George C. Brackett Library Fund, Income:*

Balance, January 1, 1916	$ 11.91
Income, 1916	25.00
	36.91
Expended	0.00
Balance, December 31, 1916	$ 36.91

6. *Sustaining Membership:*

Balance, January 1, 1916	$ 3.30
Received, 1916	175.29
	178.59
Expended	176.58
Balance, December 31, 1916	$ 2.01

7. Annual Membership:		
Balance, January 1, 1916		$ 191.97
Received, 1916		930.00
		1,121.97
Expended		1,120.84
Balance, December 31, 1916		$ 1.13
8. Special Contribution—Japanese Garden:		
Received, 1916		$ 171.56
Expended		170.31
Balance, December 31, 1916		$ 1.25
9. Tuition and Sales:		
Balance, January 1, 1916		$ 120.85
Received:		
(*a*) Instruction	$ 492.25	
(*b*) Penny seed-packets	1,108.88	
(*c*) Incidentals	97.23	1,698.36
		1,819.21
Expended:		
(*a*) Instruction	$1,010.79	
(*b*) Penny seed-packets	556.74	
(*c*) Incidentals	0.00	1,567.53
Balance, December 31, 1916		$ 251.68
Summary of Private Funds Accounts:		
Balance, January 1, 1916		$ 539.72
Income, 1916		13,143.00
		13,682.72
Contributed to Maintenance Accounts	$4,096.43	
Expended	9,683.81	13,780.24
Deficit, December 31, 1916		$ 97.52

APPROPRIATIONS OF CORPORATE STOCK OF THE CITY OF NEW YORK FOR PERMANENT IMPROVEMENTS, AND EXPENDITURES THEREFROM DURING 1916

C.D.P. 200-J. (*$40,000.00.*) *For Grading, Draining, Piping, and Soil Improvements*

Balance, January 1, 1916	$93.20
Expenditures:	
Olmsted Brothers, balance due on bill for professional services in connection with construction of walks	33.05
Balance, December 31, 1916	$60.15

C.D.P. 200-K. *($30,000.00.) For Construction of Roadways, Walks, Stone Steps, and Paving*

Balance, January 1, 1916	$425.25
Expenditures:	
Olmsted Brothers, partial payment on bill for professional services in connection with construction of walks	425.25
Balance, December 31, 1916	$ 0.00

C.D.P. 200-L. *($100,000.00.) For Buildings*

Balance, January 1, 1916	$5,789.31
Expenditures:	
McKim, Mead & White, architects, for professional services	5,789.31
Balance, December 31, 1916	0.00

C.D.P. 200-M. *($100,000.00.) For Improvement of the Brooklyn Botanic Garden*

Amount issued	$100,000.00
Expenditures	90,290.64
Balance, December 31, 1916	$ 9,709.36

S-566. *($100,000.00.) Suspense Account, Contribution for Brooklyn Botanic Garden Improvement Fund*

Amount appropriated	$100,000.00
Expenditures	89,903.28
Balance, December 31, 1916	$ 10,096.72

APPENDIX 1

BROOKLYN BOTANIC GARDEN

1916–1921

Aims and a Program for the Second Five Years

(Submitted to the Governing Committee 1 July, 1916)

I. Aims

1. To make the grounds of the Botanic Garden one of the most beautiful spots in Brooklyn.

2. To make the scientific collections, indoors and out, interesting, educative, and stimulating to the highest degree.

3. To make the Garden increasingly valuable as an adjunct or

supplement to the nature study and botanical work of the local schools—public and private.

4. To make the Garden an important center for the diffusion of popular and technical scientific information about plants.

5. To render the city of New York a direct and indispensable service by becoming a center of information and investigation concerning all phases of plant life in the city, with special reference to trees and shrubs in parks and streets.

6. To become a center of botanical investigation in pure and applied science, universally recognized as an institution of the first rank.

II. A Program

1. A botanic garden, supported in part by public taxation, is under a double obligation: first, to the community which fosters and supports it; second, to the science whose advancement is the only adequate justification for its existence. Our program, therefore, during the next five years, should continue, as during the past five years, plans for development along two lines:

(*a*) Public education and recreation.

(*b*) The advancement of botanical science.

2. As a matter of fundamental necessity this program will include:

(*a*) The completion of the work, now in progress, of bringing the entire area of the Garden to final grade, and establishing the lawns. The cost of this should be met entirely by annual appropriations from the tax budget; heretofore it has needed to be generously supplemented by special contributions of private funds.

(*b*) The ornamental and utilitarian planting.

(*c*) The expansion and up-keep of the scientific plantations (already well under way), including the labeling.

(*d*) The providing of plenty of garden seats, of attractive type.

(*e*) The erection of a new, unclimbable fence surrounding the entire garden.

(*f*) The construction of seven public entrances (with entrance and exit turnstiles located as follows):

(1) Eastern Parkway—A monumental entrance, harmonizing in architecture and dignity with the Museum Building east of it. There is a subway station at this entrance.

(2) Flatbush Avenue at Malbone Street. This will doubtless, very shortly, be the most used entrance, or, at least, second only to the one on Eastern Parkway.

(3) Washington Avenue, just north of the Brighton Beach R. R. cut.

(4) Washington Avenue at the main entrance to the laboratory building.

(5) Washington Avenue north of laboratory building (nearest entrance for Japanese garden).

(6) Flatbush Avenue, near the reservoir property.

(7) Flatbush Avenue, at the southern end of the esplanade.

(*g*) The construction of two water basins (for tropical and other water plants) just west of the north and south wings of the plant houses.

(*h*) The construction of stone steps and curbs, as planned, west of the laboratory building and conservatories.

(*i*) The construction of retaining walls (and ornamental planting), with water basin and fountain, at the museum embankment at the north end of the esplanade.

(*k*) The construction of a water basin and fountain at the southern end of the esplanade.

(*l*) The construction of stone bridges over the brook.

3. Besides the necessary preliminary labor in connection with the preparation of buildings and grounds, work which has occupied much of our effort and most of our resources during our first five years of existence, our activities have been largely in the direction of developing popular instruction for children and adults. This has been appropriate, and the Garden staff has thrown itself into this work with enthusiasm and ability, and (others tell us) with some considerable measure of success. This work has not, by any means, yet reached high-water mark; it never will; it should be continued, perfected, and expanded, from year to year, at a rate indicative of normal healthy growth.

4. But it is now time to initiate a more vigorous development

of the Garden as a scientific institution, to lay plans (and take steps for their realization) to make the Garden unsurpassed as a center of botanical investigation.

Our research work should develop along two lines: (*a*) Plant industry; (*b*) Pure science.

(*a*) Plant industry: Industrial research involves work whose results are (or at least promise to be) immediately applicable in the solution of practical problems, such as the treatment and prevention of diseases of agricultural crops, and of trees, shrubs, and herbaceous plants in the city parks, streets, and homes; investigation of the environmental influences which affect the growth of trees and other plants in a city. These (and others) are problems of the first importance, and will challenge the best efforts of a competent plant pathologist, a forester or arboriculturist, a plant physiologist or ecologist, and possibly an economic entomologist.

(*b*) Pure science: Botanical researches in pure (as distinguished from applied) science are the bed-rock of all our other activities—educational or scientific. The conduct of our educational work, the proper care of our scientific collections, and their administration in a way to make them of largest usefulness, demand a staff of competent specialists, whose value to the Garden is to be measured largely by their interest in botanical science, in plants and botanical principles for their own sake, and not merely for the practical applications which may be made of the fruits of research. Investigations undertaken in the spirit of pure science are the most fundamental of all, and by them is botanical science most rapidly and substantially advanced.

I take it as axiomatic (thoughtful consideration will make it self-evident) that our institution must foster and encourage in every possible way the prosecution here of botanical research for its own sake.

5. The vigorous development of research will involve the creation and manning of special research positions. These may be of the nature of one or both of the two following types:

(*a*) *Resident Investigators:* For *resident investigators* it is contemplated appointing either young men who may be pursuing an investigation in connection with graduate study for an ad-

vanced degree at some University; or some resident of Brooklyn, or of greater New York (*e. g.*, a high-school teacher), who can arrange to devote sufficient time during the year to research to make it worth while. In the latter case the payment might be made in part as an honorarium to the incumbent, and in part for defraying necessary expenses in connection with the prosecution of the research (traveling expenses, assistance, etc.)

In some cases such appointments may be made without cost to the Garden, except for necessary expenses incidental to the satisfactory progress of the work, and in consideration of a certain amount of service to be rendered the Garden, in the way of scientific assistance.

(*b*) *Research Curators:* In connection with the proposed *research curatorships,* the director of the Garden has in mind the fact that from time to time men of recognized ability and ripe experience are being retired from active service at our various universities on account of having reached some arbitrarily fixed age limit (usually 60 years of age). Such men have from five to ten years ahead of them for effective scientific investigation and writing. The satisfactory prosecution of this work needs suitable laboratory, library, and herbarium facilities, some scientific assistance, and at least a living income. The presence of such men as members of our Garden staff would be a great inspiration to the rest of the staff; the publication of the results of their researches under the auspices of our institution would mean a great deal for the scientific standing of the Garden in the botanical world at large; we should have the advantage of their counsel and advice in all matters touching our scientific collections and scientific activities in general, and, most important of all, the ability of the Garden to contribute to the important work of the advancement of botanical science would be greatly enhanced. All such appointments should be made for a limited period—probably not more than three or five years.

Appointments to research curatorships need not necessarily be limited as above suggested, but opportunities to secure men of the type indicated would often be exceptional, and the Garden should be in a position to profit by such opportunities.

The salaries of resident investigators and research curators should be provided for from private funds.

6. Ancillary to our scientific investigations provision should be made as follows:

(*a*) For adequate laboratory equipment—to be acquired as the needs arise in connection with any investigation in progress.

(*b*) For laboratory assistants.

(*c*) For adequate library and herbarium facilities.

(*d*) For photographic and other illustrating.

(*e*) For reasonable stenographic assistance.

(*f*) For publishing the results of research.

7. Nothing can enrich and energize all of our work, from top to bottom, like the presence here of a staff of competent, zealous investigators, broad-minded enough to be interested, not only in their own immediate problems, but in furthering the entire purpose, possibilities and duties of such an institution as the Brooklyn Botanic Garden aims to be. Every piece of research prosecuted in our laboratories will enrich our scientific collections, our library, our illustrative material, our public exhibits, and our popular educational work, and will become a stimulus to every member of staff. With the start we have, with our unsurpassed location in a city fast becoming the scientific and educational center of our entire country, with only two or three such botanical institutions as is here proposed now existing in this country, and very few in the entire world, our opportunity and our duty seem clearly indicated.

III. Needs

To accomplish the work above outlined funds will be needed (by the end of the five-year period) approximately as follows:

Permanent Improvements.—Between $100,000 and $125,000—to be furnished through the issue of corporate stock of the City of New York for the new fence, suitable entrances, water basins, stone walls, stone steps and curbing, and other permanent improvements.

Maintenance.—$45,000 for 1918, to be increased ultimately to not less than $60,000, to be paid from the city tax budget for the maintenance of the Garden so far as it is a public charge.

Endowment.—An endowment fund (now $78,000) needing to be increased to $500,000, and ultimately more, the income to be

used for the purchase of specimens and books, for the publication of scientific and popular contributions, for research and exploration, scientific lectures, scientific apparatus, etc. The well-known advantages of an endowment fund are of course the same for the Brooklyn Botanic Garden as for any other scientific and educational institution.

If the plans above briefly outlined can be realized within a reasonable period of time (approximately five years), the Garden will be an institution in which every citizen, not only of Brooklyn but of the entire Greater New York, may feel a justifiable pride. But financially we must become *entirely independent* of "popular" interest and approval, and so far as our scientific work is concerned, entirely independent of political favor and fortunes, if we are to accomplish all that we ought as a scientific and educational institution of the first rank, and if we are to secure the establishment of this work on a solid and permanent basis.

Respectfully submitted,

C. Stuart Gager,

Director.

APPENDIX 2

Publications of Members of Staff and Registered Investigators during 1916

Benedict, Ralph C.

—— Some horticultural fern variations. *Am. Fern Jour.* **6**: 8015. pl. 1–3. March.

—— The origin of new varieties of Nephrolepis by orthogenetic saltation: I. Progressive variations. *Bull. Torrey Club* **43**; 207–234. pl. 10–15. June.

—— An Adirondack fern-list. *Am. Fern Jour.* **6**: 81–85. Sept.

—— The Nephrolepis collection at the Brooklyn Botanic Garden. *Brooklyn Bot. Gard. Record* **5**: 143–148. October. (Also published in several horticultural weeklies, *Horticulture, Florists' Exchange,* and, in modified form in *Bailey's Standard Cyclopedia of Horticulture, Vol. IV.*

Free, Montague

—— Why not have a greater variety of hardy plants? *Florists' Exchange* 41:750–751. Mar. 25th.

—— Principles of plant culture. (Review.) *Torreya* 16: 186. Aug.

—— Alpine plants. *Florists' Exchange* 42: 445, 473. Aug. 26th; 42: 527. Sept. 2d; 42: 639, 640. Sept. 16th.

—— The Alpine house. *Florists's Exchange.* 42: 1021. Nov. 4th.

Gager, C. Stuart

—— The Brooklyn Botanic Garden. *Jour. Nat. Inst. Social Sciences* 1: 99–100. January.

—— Colonel Woodward and the Garden. *Bot. Gard. Record* 5: 12–15. January.

—— Fifth Annual Report of the Brooklyn Botanic Garden, 1915. *Bot. Gard. Record* 5: 21–51. April.

—— The Japanese Garden. *Brooklyn Bot. Gard. Leaflets* III[5]. May 3.

—— Remarks (at the laying of the cornerstone of the laboratory building). *Bot. Gard. Record* 5: 114–116. July.

—— Present status of the problem of the effect of radium rays on plant life. *Mem. N. Y. Bot. Gard.* 6: 153–160. Aug. 31.

—— Fundamentals of Botany pp. 1—xix + 640, figs. 435. Philadelphia, P. Blakiston's Son & Co. September.

—— A laboratory guide for general botany pp. 1—viii + 191. Philadelphia, P. Blakiston's Son & Co. Nov. 17.

Gundersen, Alfred

—— Ten common trees of Brooklyn. *Brooklyn Bot. Gard. Leaflets* IV[3]. April 19.

—— The wild flower garden in May. *Ibid.* IV[4]. April 26.

—— Some early botanists. *Ibid.* IV[13]. October 18.

Olive, Edgar W.

—— Doctorates in botany conferred by America universities in 1915. *Brooklyn Bot. Gard. Record* 5: 15–19. January.

—— Report of the curator of public instruction. *Brooklyn Bot. Gard. Record.* 5: 57–68. April.

—— Report of a trip to study and collect rusts and other parasitic fungi of Porto Rico. *Brooklyn Bot. Gard. Record* 5: 117–122. July.

—— Weiss, Imms and Robinson's Plants in Health and Disease (Review). *Torreya* **16**: 271. December.

Shaw, Ellen Eddy

—— Little bulbs for little people. Folder issued by A. T. Boddington, New York.

—— List of talks for elementary school classes. (School number.) *Brooklyn Bot. Gard. Leaflets* **IV**[1]. April 5.

—— The third annual garden exhibit for Brooklyn boys and girls. (Children's number.) *Brooklyn Bot. Gard. Leaflets* **IV**[2]. April 12.

—— The Brooklyn Botanic Garden boys' and girls' clubs. *Brooklyn Bot. Gard. Leaflets* **IV**[7]. June 14.

—— Bulb culture. (Reprint of Series I, no. 12). *Brooklyn Bot. Gard. Leaflets* **IV**[10]. Sept. 13.

—— Talks for elementary school classes. *Brooklyn Bot. Gard. Leaflets* **IV**[12]. Oct. 11.

Taylor, N.

—— Endemism in the flora of the vicinity of New York. *Torreya* **16**: 18–28. January.

—— Wild Flower Preservation Society of America. *Torreya* **16**: 79, 80. April.

—— Report of the Curator of Plants for 1915. *Brooklyn Bot. Gard. Record* **5**: 51–57. April.

—— A white-cedar swamp at Merrick, Long Island, and its significance. *Mem. N. Y. Bot. Gard.* **6**: 79–88. August.

—— The ascent of the Turquino, the highest mountain in Cuba. *Torreya* **16**: 211–225. October. (Letter of F. W. Ramsden, and other notes on the region arranged and edited.)

—— What the winter of 1915 did to the Garden evergreen collections. *Brooklyn Bot. Gard. Record* **5**: 140–143. October.

—— Yong's Catalogue d'Arbres Arbustes et Plantes Herbacées d'Amerique. (Review.) *Torreya* **16**: 244–245. November.

White, Orland E.

—— Studies of teratological phenomena in their relation to evolution and the problems of heredity. II. The nature, causes, distribution, and inheritance of fasciation with special reference to its occurrence in *Nicotiana*. *Zeitschrift f. induktive Abstamm. u. Vererbungslehre* **15**: pp. probably 70 or 80. Figs. 1–28. Tables A–F + 1–26.

—— Field trips for the study of variation and evolution. *Brooklyn Bot. Gard. Leaflets* **IV**[8]: pp. 4. June.

—— Variation, environment and the laws of heredity. *Ibid.* **IV**[9]: pp. 1–12. Figs. 1–9. June.

—— The origin and history of our more common cultivated fruits. *Ibid.* **IV**[11]; pp. 1–12. Sept.

—— The ancient history of plants. *Ibid.* **IV**[14]: pp. 1–12. Figs. 1–6. October.

—— Inheritance studies in *Pisum*. I. Inheritance of cotyledon color. *Am. Nat.* **50**: 530–547. 4 tables. 1916.

APPENDIX 3

PUBLIC LECTURES, ADDRESSES AND PAPERS GIVEN BY MEMBERS OF STAFF DURING 1916

By the director of the Garden:

January 25. *The Brooklyn Botanic Garden.* Commercial High School Assembly, Brooklyn.

April 8. *Five years of the Brooklyn Botanic Garden.* Brooklyn Institute Science Room Conference, Academy of Music.

April 29. *The need of a zoological park in Brooklyn.* At dedication of first section of the first zoological building, Prospect Park.

November 1. *The study of plants.* Eastern District High School Assembly, Brooklyn.

December 15. *The Botanic Garden and the Department of Botany of the Institute.* Academy of Music, Science Room.

By the curator of plants:

February 3. *Conservation of our National Woodlands.* Rotary Club. Hotel McAlpin.

May 12. *Preservation of our native wild plants.* Greenwich Garden Club.

December 5. *Preservation of our native wild plants.* International Garden Club, New York.

By the curator of public instruction:

January 21. *Trees.* Two lectures before Girls' High School Annex.

May 31. *Porto Rican Rusts.* Torrey Botanical Club.

September 14 and 15. *The Brooklyn Botanic Garden.* Two lectures before the biology teachers of Erasmus Hall High School and Boys' High School.

September 19. *The Brooklyn Botanic Garden.* Before class from Brooklyn Teachers' Training School.

October 21. *A botanical trip to Porto Rico.* Science Room Conference, Brooklyn Academy of Music.

December 30. *A peculiar rust from Porto Rico.* Bot. Soc. Am. and Am. Phytopath. Soc., Columbia University.

By the curator of plant breeding:

March 20 and April 3. *Heredity, variation and environment.* Pratt Institute Class, Brooklyn Botanic Garden.

December 28. *The inheritance of cotyledon color, cotyledon shape, and foliage color in peas, with special reference to linkage and other inter-relations of factors.* Bot. Soc. Am., Columbia University.

December 29. *Variation and heredity in peas.* Am. Soc. Nat., Columbia University.

By the curator of elementary instruction:

January 25. *Address at the graduation exercises of P. S. No. 36.*

March 1. *Garden work for children.* Ladies' Aid Society, Jamaica.

March 7. *Children's garden work.* School of Horticulture, Ambler, Pa.

March 23. *Home gardens.* Berkeley Institute.

March 29. *Forestry.* Technical High School, N. Y. C.

May 3. *Gardens.* New Paltz Normal School, New Paltz, N. Y.

July 7. *What the Brooklyn Botanic Garden is doing for children.* Garden Section of the N. E. A., New York City.

Sept. 18. *Garden Work.* Teachers' Institute, Central Museum.

Nov. 22. *Trees.* Berkeley Institute Assembly.

By the assistant curator of the herbarium:

February 16. *Native wild flowers.* Inkowa Club, New York.

November 16. *Foreign trees in our city parks.* Torrey Botanical Club, New York.

By the resident investigator:

December 28. *The origin of new varieties of Nephrolepis by reversion.* Bot. Soc. Am., Columbia University.

APPENDIX 4

BOARD OF ESTIMATE AND APPORTIONMENT

RESOLUTION ADOPTED MARCH 3, 1916, APPROVING THE FORM OF CONTRACT, ETC., FOR THE CONSTRUCTION OF A ROCK GARDEN.

Department of Parks, Borough of Brooklyn—Approval of Contract, Plans, Specifications, Etc. (Cal. No. 65)

The Secretary presented a communication dated February 7, 1916, from the Commissioner of Parks, Borough of Brooklyn, requesting approval of form of contract, plans, specifications, etc., for the construction of a rock garden in the Botanic Garden and Arboretum, at an estimated cost of $2,200; and the following report of the Bureau of Contract Supervision recommending approval thereof in the sum of $2,000:

FEBRUARY 28, 1916.

TO THE BOARD OF ESTIMATE AND APPORTIONMENT:

Gentlemen: On February 8, 1916, you referred to the Bureau of Contract Supervision a communication from the Commissioner of Parks, Borough of Brooklyn, dated February 7, 1916, requesting the approval of form of contract, plans, specifications and estimate of cost, $2,200, for the construction of a rock garden in the Botanic Garden and Arboretum.

It is proposed to charge one half the cost of this work to the corporate stock fund entitled "C.D.P. 200-M. Improvement of Botanic Garden," and the remaining half to the fund entitled "S-566. Suspense Account, Contribution for Brooklyn Botanic Garden Improvement Fund."

In building roads and other improvements, by departmental labor, in the Garden, many large boulders have been excavated, which have not been removed because of the expense involved. These have been accumulating for some years. Their number has increased considerably by additions due to excavating for the buildings at the Garden. There are now about

640 boulders, ranging in weight from fifty pounds to twelve tons, gathered in the Garden.

It is proposed to use these boulders in the construction of a rock garden in which will be grown and exhibited certain classes of plants of scientific interest, facilities for the growing of which do not now exist. It is considered that this will add an attractive feature to the Botanic Garden.

The form of contract and plans are satisfactory. The specifications have been revised, in minor particulars, by the Park Department at the suggestion of this bureau, and it is believed that the work as now specified can be performed at a cost not exceeding $2,000.

There is sufficient balance in the funds to which the cost of the work is to be charged to meet the cost.

The adoption of the attached resolution will grant the request at an estimated cost of $2,000.

Respectfully,

PETER J. MCGOWAN,
Acting Director.

The following resolution was offered:

Resolved, That the Board of Estimate and Apportionment hereby approves the form of contract, plans, specifications, as amended, and estimate of cost in the sum of two thousand dollars ($2,000), for the construction of a rock garden in the Botanic Garden and Arboretum, under the jurisdiction of the Commissioner of Parks, Borough of Brooklyn, the cost to be charged as follows: One half (½) to the corporate stock fund entitled, "C. D. P. 200-M, Improvement of Botanic Garden," and one half (½) to the fund entitled "S 566, Suspense Account, Contribution for Brooklyn Botanic Garden Improvement Fund"; provided, however, if no bids are received for such work within the estimated cost, the amount of such estimated cost upon the bids so received may be reconsidered in its discretion by the Board of Estimate and Apportionment, or by any official designated by the Board, provided that any of the bids is within the amount authorized and available for said work.

Which was adopted by the following vote:

Affirmative.—The Acting Mayor, the Comptroller and the Presidents of the Boroughs of Manhattan, Brooklyn, The Bronx, Queens and Richmond—13. (*City Record* 44: 1952. 10 March, 1916.)

APPENDIX 5

BOARD OF ESTIMATE AND APPORTIONMENT

Resolution Adopted April 7, 1916, Approving the Forms of Contracts, and the Plans and Specifications, etc., for the Construction of a Children's Building

Department of Parks, Borough of Brooklyn—Approval of Contract, Plans, Specifications, Etc. (Cal. No. 30)

The Secretary presented a communication dated March 13, 1916, from the Commissioner of Parks, Borough of Brooklyn, transmitting form of contracts, plans, specifications, etc., for furnishing labor and material for completion of Children's Garden House in the Botanical Gardens, Borough of Brooklyn, at an estimated cost of $6,650; and the following report of the Bureau of Contract Supervision recommending approval thereof at $6,550:

March 29, 1916.

To the Board of Estimate and Apportionment:

Gentlemen: On March 14, 1916, you referred to the Bureau of Contract Supervision two communications from the Commissioner of Parks, Borough of Brooklyn, requesting approval of forms of contract, specifications, plans and estimates of cost, aggregating $6,650, for all labor and materials required for the completion of the Children's Garden House, including the plumbing, drainage, water supply system and plumbing fixtures, the cost to be charged as follows: One half to the corporate stock fund entitled "C.D.P. 200-M. Improvement of Botanic Garden," and one half to the fund entitled "S-566. Suspense Account, Contribution for Brooklyn Botanic Garden Improvement Fund."

The proposed building is to be used by the Botanic Garden in connection with about 200 garden plots which they maintain for the use of children in the growing of vegetables and flowers. This activity is both recreational and educational and similar plots are maintained at various playgrounds throughout the city.

The proposed building is approximately 35 feet by 45 feet and is of a type of construction which conforms with the other structures in the Botanic Garden.

The estimated cost has been reduced to $6,550 by the department, through the elimination of electric lighting, as the building will not be in use after dark.

The forms of contract, and the plans and specifications, as amended, are satisfactory and the aggregate estimate cost of $6,550 is reasonable. There

are sufficient unencumbered balances in the accounts to which this work is to be charged to meet the expenditure.

The adoption of the attached resolution will grant the requested approval at an estimated cost of $6,550.

Respectfully,

PETER J. MCGOWAN,

Acting Director.

The following resolution was offered:

Resolved, That the Board of Estimate and Apportionment hereby approves the forms of contracts, and the plans and specifications, both as amended, and estimates of cost aggregating six thousand, five hundred and fifty dollars ($6,550) for the construction of a Children's Garden House in the Brooklyn Botanic Garden, under the jurisdiction of the Department of Parks, Borough of Brooklyn, as follows:

Construction	$5,800
Plumbing	750

—the cost to be charged as follows: One half (½) to the corporate stock fund entitled "C. D. P. 200M—Improvement of Botanic Garden," and one half (½) to the fund entitled "S566—Suspense Account, Contribution for Brooklyn Botanic Garden Improvement Fund"; provided, however, if no bids are received for both items of said work within the aggregate estimated cost, the amount of such estimated cost upon the bids so received may be reconsidered in its discretion by the Board of Estimate and Apportionment, or by any official designated by the Board, provided that the aggregate of the bids is within the amount authorized and available for said work.

Which was adopted by the following vote:

Affirmative.—The Mayor, the Comptroller, the Acting President of the Borough of Manhattan, and the Presidents of the Boroughs of Brooklyn, The Bronx, Queens and Richmond—13.

Negative.—The President of the Board of Aldermen—3.

(*City Record* 44: 2872. 14 April, 1916.)

APPENDIX 6

BOARD OF ESTIMATE AND APPORTIONMENT

Resolution Adopted April 28, 1916, Approving Form of Proposed Preliminary and Final Contracts for Architects' Services

Department of Parks, Borough of Brooklyn—Approval of Contracts for Architectural Services (Cal. No. 86)

The Secretary presented a communication dated March 11, 1916, from the Commissioner of Parks, Borough of Brooklyn, transmitting preliminary and final contracts for architectural services in connection with construction of Children's Garden House in the Brooklyn Botanic Garden; and the following report of the Bureau of Contract Supervision, recommending approval thereof:

April 22, 1916.

To the Board of Estimate and Apportionment:

Gentlemen: On March 14, 1916, you referred to the Bureau of Contract Supervision a communication from the Commissioner of Parks, Borough of Brooklyn, dated March 11, 1916, requesting approval of proposed preliminary and final contracts with McKim, Mead and White, architects, for architectural services in connection with the construction of the Children's Garden House in the Brooklyn Botanic Garden.

The work, in connection with which these architectural services will be required, was authorized by the Board of Estimate and Apportionment on April 7, 1916, to the extent of $6,550.

The proposed final contract provides for a flat rate of five per cent. (5%) as total compensation to the architects for the preparation of plans, specifications and estimates of cost, together with the supervision of all of the work; said 5 per cent. to be based on the final completed cost of construction work. The preliminary contract provides for a payment to the architects of the sum of $70 on the acceptance of preliminary plans by the department, such payment being approximately one per cent. of the preliminary estimate of cost; said amount to be deducted from the five per cent. to be paid on the final contract.

The cost of these contracts is to be charged equally against the following funds: "C.D.P. 200-M. Improvement of Botanic Garden" and "S-566. Suspense Account, Contribution for Brooklyn Botanic Garden Improvement Fund," in which there are sufficient unencumbered balances to meet this cost. The forms of both contracts are satisfactory, and the rate of compensation is reasonable.

I recommend the adoption of the attached resolution granting the request.

Respectfully,

TILDEN ADAMSON,
Director.

The following resolution was offered:

Resolved, That the Board of Estimate and Apportionment, pursuant to its resolution of July 11, 1912, hereby approves the form of proposed preliminary and final contracts with McKim, Mead and White, for architectural services in connection with the construction of the Children's Garden House in Brooklyn Botanic Garden, at an estimated cost of seventy dollars ($70) for the preliminary, and two hundred and eighty dollars ($280) for the final contract (or five per cent. 5%) of the total cost of construction, less the amount paid under the preliminary contract, to be charged as follows: One half to the corporate stock fund entitled "C. D. P. 200M—Improvement of Botanic Gardens," and one half to the fund entitled "S566—Suspense Account, Contribution for Brooklyn Botanic Garden Improvement Fund."

Which was adopted by the following vote:

Affirmative.—The Comptroller, the President of the Board of Aldermen, and the Presidents of the Boroughs of Manhattan, Brooklyn, The Bronx, and Queens, and the Acting President of the Borough of Richmond—13. (*City Record* 44: 3488. 9 May 1916.)

APPENDIX 7

BOARD OF ESTIMATE AND APPORTIONMENT

RESOLUTION ADOPTED FRIDAY, MAY 26, 1916, APPROVING THE ISSUING OF AN OPEN MARKET ORDER IN THE SUM OF $648 FOR EXTENSION OF IRRIGATION SYSTEM

Department of Parks, Borough of Brooklyn—Authority to Issue Open Market Order (Cal. No. 70)

The Secretary presented a communication dated May 4, 1916, from the Commissioner of Parks, Borough of Brooklyn, requesting authority to issue open market order in the sum of $648 for the purpose of furnishing labor and materials for installing an ir-

rigation system in the Botanic Garden, Borough of Brooklyn; and the following report of the Bureau of Contract Supervision recommending approval thereof:

May 16, 1916.

To the Board of Estimate and Apportionment:

Gentlemen: On May 6, 1916, you referred to the Bureau of Contract Supervision a communication from the Commissioner of Parks, Borough of Brooklyn, dated May 4, 1916, requesting approval of the issuance of an open market order in the amount of $648 for the purpose of furnishing all labor and materials necessary in connection with the installation of an irrigation system in the southerly extension of the Brooklyn Botanic Garden; the cost of the work to be charged to the corporate stock fund entitled "Improvement of Botanic Garden, C.D.P. 200-M."

The proposed irrigation system is similar to the one now in use in the original Botanic Garden and consists of 500 linear feet of four-inch cast-iron main from which are extended one inch laterals and eleven risers with hose bibs.

The work is necessary before successful results can be obtained from planting in this extension.

There was $100,000 authorized in the fund C.D.P. 200-M. in connection with a gift of a similar amount, the latter of which has been set up under code "S-566. Suspense Account, Contribution for Brooklyn Botanic Garden Improvement Fund." One half the amount of this open market order, therefore, should be a charge against each of the above accounts.

In view of the present high cost of pipe the amount which it is proposed to expend for this work is reasonable.

There is sufficient balance in each of the accounts to meet the proposed expenditure.

I recommend the adoption of the attached resolution granting the request, but charging one half of the cost to each of the accounts C.D.P. 200-M. and S-566.

Respectfully,

Tilden Adamson,
Director.

The following resolution was offered:

Resolved, That the Board of Estimate and Apportionment, pursuant to its resolution of July 11, 1912, and subject to the provisions of section 419 of the Greater New York Charter, hereby approves of the issuance of an open market order in the sum of six hundred and forty-eight dollars ($648), for the furnishing of material for, and the installation of, an irrigation system in the southerly extension to the Brooklyn Botanic Garden,

said work to be done under the jurisdiction of the Commissioner of Parks, Borough of Brooklyn, and to be charged as follows: One half to the corporate stock fund entitled "C. D. P. 200M—Improvement of Botanic Gardens," and one half to the fund entitled "S566—Suspense Account, Contribution for Brooklyn Botanic Garden Improvement Fund."

Which was adopted by the following vote:

Affirmative.—The Mayor, the Deputy and Acting Comptroller, the President of the Board of Aldermen, the Acting President of the Borough of Manhattan and the Presidents of the Boroughs of Brooklyn, The Bronx, Queens and Richmond—16. (*City Record* 44: 4288–4289. 6 June, 1916.)

APPENDIX 8

BOARD OF ESTIMATE AND APPORTIONMENT

Resolution Adopted September 22, 1916, Authorizing Payment of Claim of Olmsted Bros.

(On September 15, 1916 (Cal. No. 74), the certificate of the Deputy and Acting Comptroller was presented and the matter laid over until this meeting.)

The secretary presented the following certificate of the Deputy and Acting Comptroller:

September 1, 1916.

To the Honorable, the Board of Estimate and Apportionment:

Gentlemen: Under and pursuant to the provisions of section 246 of the Greater New York Charter I hereby certify that an application has been presented by Olmsted Brothers for the payment of $458.30, alleged to be due them for professional services as landscape architects, and disbursements made, in connection with a contract between the Department of Parks, Borough of Brooklyn, and Louis J. Sieling, dated April 29, 1915; that said services were rendered and disbursements were made, during the year 1915, in good faith at the instance of the Department of Parks, Borough of Brooklyn; that no action has been instituted on the claim upon which this application is based; that a service contract for the work in question was submitted to the Board of Estimate and Apportionment for their approval, but the same was never approved by the Board, and in accordance with a communication from the corporation counsel under date of August 2, 1916, relative to this application, the claim for the services

rendered and moneys disbursed is illegal and invalid as against the city of New York; but notwithstanding, in my judgment, it is equitable and proper for the city to pay the claim in the sum of $458.30, inasmuch as the city has received a benefit and derived an advantage which in money value is equal to said sum and that said sum of $458.30 is the amount which should be paid in full satisfaction of the claim from the appropriate fund available for the purpose.

Respectfully,
EDMUND D. FISHER,
Deputy and Acting Comptroller.

The following resolution was offered:

Resolved, That the Board of Estimate and Apportionment, pursuant to the provisions of section 246 of the Greater New York Charter, being chapter 601 of the Laws of 1907, as amended, hereby determines that the City has received a benefit from, and is justly and equitably obligated to pay Olmsed Brothers, without interest, the sum of four hundred and fifty-eight dollars and thirty cents ($458.30) for work, labor and services rendered, and for moneys disbursed, as landscape architects in connection with a contract between the Department of Parks, Borough of Brooklyn, and one Louis J. Sieling, for the construction of walks in the southerly extension of Brooklyn Botanical Garden entered into on or about April 29, 1915; that the said sum shall be paid in full satisfaction of their claim for such services and disbursements; that the interest of the city will be best subserved by the payment of said claim in that amount and such payment shall only be made upon the execution by the said claimants, of a full release in favor of the city, in such form as shall be approved by the corporation counsel, and the Comptroller be and is hereby authorized to pay said claim in the sum of four hundred and fifty-eight dollars and thirty cents ($458.30), out of the appropriate fund available for the purpose.

Which was adopted by the following vote:

Affirmative.—The Mayor, the Deputy and Acting Comptroller, the President of the Board of Aldermen, the Presidents of the Boroughs of Manhattan, Brooklyn and The Bronx, the Acting President of the Borough of Queens and the President of the Borough of Richmond—16. (*City Record* 44: 7187. 4 October, 1916.)

APPENDIX 9

BOARD OF ESTIMATE AND APPORTIONMENT

Final Action Concerning Fourth Section of Plant Houses

(From Minutes of Meeting of Board of Estimate and Apportionment, Held Friday, October 6, 1916)

Board of Estimate and Apportionment—Requests of Various Departments for Approval of Contracts, Plans, Specifications, Etc. and Open Market Orders Approved During the Summer Months (Cal. No. 47).

The Secretary presented the following report of the Bureau of Contract Supervision which was ordered printed in the minutes and filed:

September 30, 1916.

To the Board of Estimate and Apportionment:

Gentlemen: Attached hereto, I am transmitting list of matters approved by the Comptroller for plans and specifications and open market orders in accordance with resolution adopted by your Board on June 9, 1916.

Respectfully,

Tilden Adamson,
Director.

Note.—Among the items approved was the following referring to the fourth section of our plant houses:

Forms of contracts, plans and specifications for construction, plumbing and drainage, and steam heating for greenhouses in the Brooklyn Botanic Garden .....Aug. 16, 1916, $11,000

(*City Record* 44: 7487–7488. 18 Oct. 1916.)

APPENDIX 10

BOARD OF ESTIMATE AND APPORTIONMENT

Resolution Adopted November 10, 1916, Approving the Issuing of an Open Market Order in the Sum of $309.00 for Snow Guards

Department of Parks, Borough of Brooklyn—Expenditure of Corporate Stock Funds (Cal. No. 46)

The Secretary presented a communication dated October 21, 1916, from the Commissioner of Parks, Borough of Brooklyn,

requesting authority to expend corporate stock funds by open market order for installation of snow guards on roof of greenhouses in the Brooklyn Botanic Garden; and the following report of the Bureau of Contract Supervision recommending approval thereof:

November 6, 1916.

To the Board of Estimate and Apportionment:

Gentlemen: On October 25, 1916, you referred to the Bureau of Contract Supervision a communication from the Commissioner of Parks, Borough of Brooklyn, dated October 21, 1916, requesting approval of the issuance of two open market orders aggregating $309 for the purpose of furnishing all labor and materials necessary in connection with the installation of snow guards on certain parts of the roof of the greenhouses in the Brooklyn Botanic Garden, the cost of the work to be charged as follows:

One half (½) to the corporate stock fund entitled "C.D.P. 200-M.—Improvement of Botanic Garden," and one half (½) to the fund entitled "S-566, Suspense Account, Contribution for Brooklyn Botanic Garden Improvement Fund."

The proposed snow guards are necessary, the estimated cost is reasonable for the work to be done, and the proposed expenditure is a proper charge against the accounts mentioned, in which there are unencumbered balances sufficient for the purpose.

I recommend the adoption of the attached resolution granting the request.

Respectfully,

Tilden Adamson,
Director.

The following resolution was offered:

Resolved, That the Board of Estimate and Apportionment, pursuant to its resolution of July 11, 1912, and subject to the provision of section 419 of the Greater New York Charter, hereby approves of the expenditure by the Commissioner of Parks, Borough of Brooklyn, of the sum of three hundred and nine dollars ($309), for furnishing all labor and materials necessary for the construction of steel and wire mesh snow guards on certain parts of the roof of the greenhouses in the Brooklyn Botanic Garden, to be charged as follows: One half (½) to the corporate stock fund entitled "C. D. P. 200M—Improvement of Botanic Garden" and one half (½) to the fund entitled "S566—Suspense Account, Contribution for Brooklyn Botanic Garden Improvement Fund."

Which was adopted by the following vote:

Affirmative.—The Mayor, the Deputy and Acting Comptroller, the President of the Board of Aldermen, the Presidents of the Boroughs of Manhattan, Brooklyn, and The Bronx, the Acting President of the Borough of Queens, and the President of the Borough of Richmond—16. (*City Record* 44: 8299. 22 Nov., 1916.)

APPENDIX 11

BOARD OF ESTIMATE AND APPORTIONMENT

Resolution Adopted December 8, 1916, Approving the Issuing of an Open Market Order in the Sum of $980 for Metal Herbarium Cases

Department of Parks, Borough of Brooklyn—Expenditure of Corporate Stock and Budget Funds (Cal. No. 133)

The Secretary presented a communication dated November 18, 1916, from the Commissioner of Parks, Borough of Brooklyn, requesting permission to expend $980 by open market order for installation of herbarium cases in laboratory building of the Brooklyn Botanic Garden; and the following report of the Bureau of Contract Supervision recommending approval thereof:

December 2, 1916.

To the Board of Estimate and Apportionment:

Gentlemen: On November 21, 1916, you referred to the Bureau of Contract Supervision a communication from the Commissioner of Parks, Borough of Brooklyn, dated November 18, 1916, requesting approval of the issuance of an open market order for $980, for furnishing and delivering two metal herbarium cases for use in the laboratory building at Brooklyn Botanic Garden, the cost to be charged as follows: One half (½) to the corporate stock fund entitled "C.D.P. 200-M.—Improvement of Botanic Garden," and one half (½) to the fund entitled "S-566.—Suspense Account, Contribution for Brooklyn Botanic Garden Improvement Fund."

The cases which it is proposed to purchase are original equipment and of a permanent nature and are to be installed in the new building. In making the budget allowance for 1917 the equipment of this building was considered to be a proper corporate stock charge.

The proposed cases are each 87 inches by 56 inches, are double faced with fourteen shelves.

Three informal bids have been received for furnishing these cases. The proposed order is for the amount of the lowest bid, which was several hundred dollars lower than the second bid, but which must be accepted within a limited period.

There are ample funds in the accounts to which the proposed order is to be charged to meet the cost.

The proposed purchase is a proper one and the cost is properly chargeable against the funds stated.

I recommend the adoption of the attached resolution granting the request.

Respectfully,
TILDEN ADAMSON,
Director.

The following resolution was offered:

Resolved, That the Board of Estimate and Apportionment, pursuant to its resolution of July 11, 1912, and subject to the provisions of section 419 of the Greater New York Charter, hereby approves the expenditure of the sum of nine hundred and eighty dollars ($980) for furnishing and delivering two (2) metal herbarium cases for use in the laboratory building at the Brooklyn Botanic Garden; the said work to be done under the jurisdiction of the Commissioner of Parks, Borough of Brooklyn and to be charged as follows: One half to the corporate stock fund entitled "C. D. P. 200M—Improvement of Botanic Garden," and one half to the fund entitled "S-566—Suspense Account, Contribution for Brooklyn Botanic Garden Improvement Fund."

Which was adopted by the following vote:

Affirmative.—The Mayor, the Comptroller, the President of the Board of Aldermen, and the Presidents of the Boroughs of Manhattan, Brooklyn, and the Bronx, the Acting President of the Borough of Queens, and the President of the Borough of Richmond—16. (*City Record* 44: 8940. 19 Dec., 1916.)

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PUBLICATIONS

OF THE

BROOKLYN BOTANIC GARDEN

RECORD. Established January, 1912. An administrative periodical, issued quarterly. Contains, among other things, the annual report of the director and heads of departments, special reports, announcements of courses of instruction, miscellaneous papers, and notes concerning Garden progress and events. Free to members of the Garden. To others one dollar a year; 25 cents a copy.

CONTRIBUTIONS. Papers originally published in botanical or other periodicals, reissued as "separates," without change of paging, and numbered consecutively. This series includes occasional papers, as well as those embodying the results of research done at the Garden, or by members of its staff or students. Twenty-five numbers constitute one volume. Price 25 cents each, $5.00 a volume.

4. *On the origin and present distribution of the pine-barrens of New Jersey.* 15 pages, figs. 2. 1912.

5. *Ingrowing sprouts of Solanum tuberosum.* 10 pages, figs. 6; plate 1. 1912.

6. *Intermingling of perennial sporophytic and gametophytic generations in Puccinia Podophylli, P. obtegens and Uromyces Glycyrrhizae.* 15 pages, 1 plate. 1913.

7. *Studies of teratological phenomena in their relation to evolution and the problems of heredity. 1. A study of certain floral abnormalities in Nicotiana, etc.* 14 pages, figs. 4. 1914.

8. *Some observations on the formation of the capillitium and the development of Physarella mirabilis Peck and Stemonitis fusca Roth.* 15 pages, 2 plates. 1914.

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10. *Inheritance studies in Pisum. I. Inheritance of cotyledon color.* 18 pages, 4 tables. 1916.

11. *Studies of teratological phenomena in their relation to evolution and the problems of heredity. II. The nature, causes, distribution and inheritance of fasciation with special reference to its occurrence in Nicotiana.* 29 figures, 30 tables. 1916.

12. *Endemism in the flora of the vicinity of New York.* 10 pages. 1916.

13. *The origin of new varieties of Nephrolepis by orthogenetic saltation. I. Progressive variations.* 28 pages, 6 plates. 1916.

14. *A white cedar swamp at Merrick, Long Island, and its significance.* 10 pages, 5 plates. 1916.

15. *Present status of the problem of the effect of radium rays on plant life.* 8 pages. 1916.

GUIDES to the collections, buildings, and grounds. Price based upon cost of publication.

LEAFLETS. Established April 10, 1913, and published weekly or biweekly during April, May, June, September, and October. The purpose of the Leaflets is primarily to give announcements concerning flowering and other plant activities to be seen in the Garden near the date of issue, and to give popular, elementary information about plant life for teachers and others. Current numbers free to all who wish them. Back series complete, 50 cents each; back numbers, 5 cents each.

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EDITED BY

C. STUART GAGER

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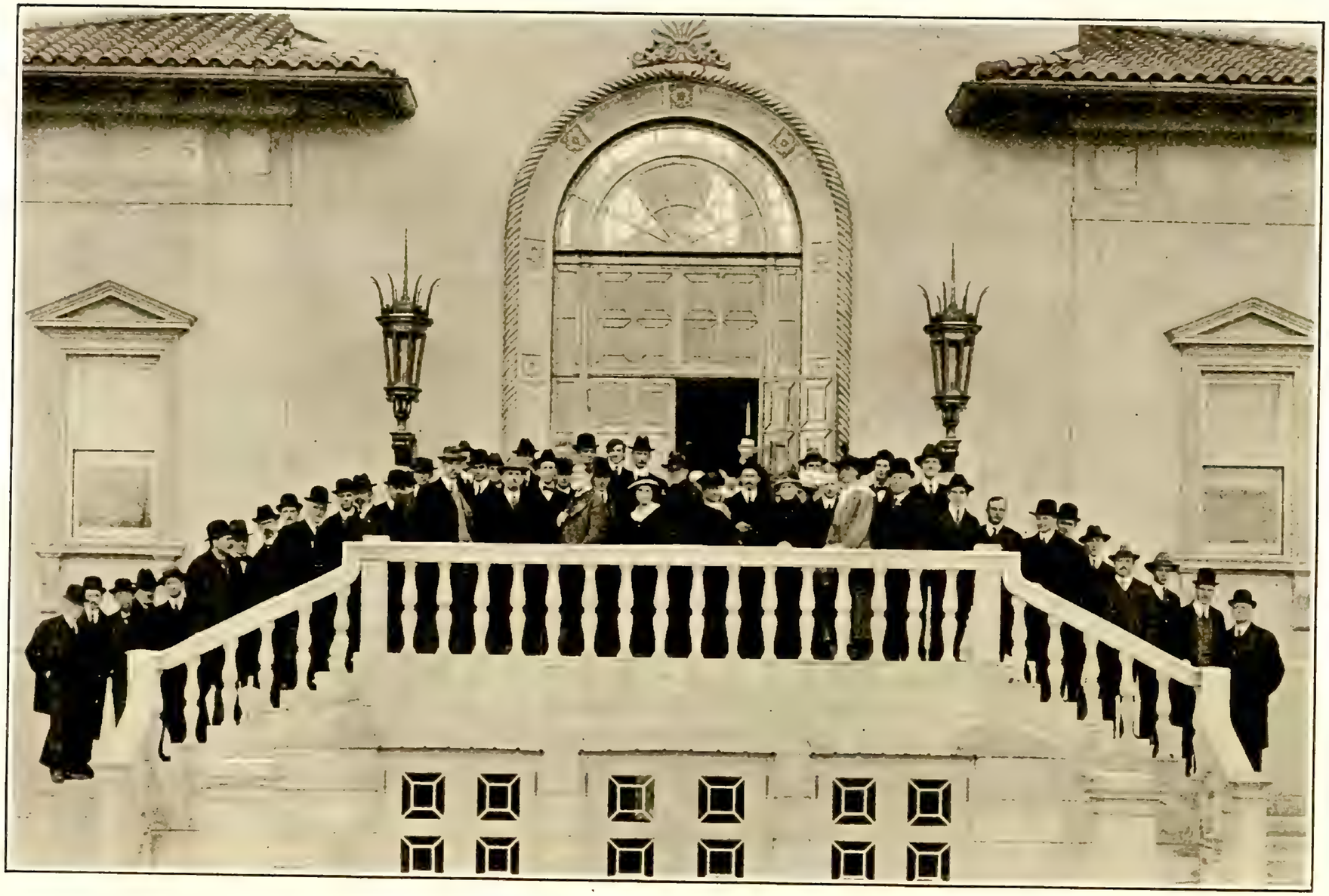

FIG. 8. Group of visiting botanists at the dedication exercises, April 20, 1917. For names see pp. 40–41.

THE BROOKLYN INSTITUTE OF ARTS AND SCIENCES

BROOKLYN BOTANIC GARDEN

RECORD

VOL. VI July, 1917 No. 3

ADDRESSES DELIVERED AT THE DEDICATION OF THE LABORATORY BUILDING AND PLANT HOUSES, APRIL 19–21, 1917

INTRODUCTORY REMARKS

BY ALFRED T. WHITE

Chairman of the Governing Committee of the Botanic Garden

Tonight these exercises open all the doors of this building to the service of the public, and it is my privilege on behalf of the Trustees of the Brooklyn Institute of Arts and Sciences, the Botanic Garden Governing Committee, and the Garden staff to welcome you all.

We are happy in having with us on this occasion officials of the City and Borough who have watched with genuine interest the growth of this undertaking, and to whose cooperation we owe success.

We welcome most cordially many of the leading scientists in botany and agriculture who have come from all over the country to participate in the meetings and scientific conferences which will fill the next two days. They come from universities and educational institutions in more than a dozen different states, from the Department of Agriculture of the United States government, and from similar departments in our own and other states.

We appreciate the compliment to the professional standing and high purposes of the director and staff of this Garden, which the presence here of these scientists conveys.

The trustees, the committee, and the staff of the Garden all welcome the opportunity which the completion of this building opens for a still broader service to the people of our city, and especially to the teachers and pupils of our public schools, whose demands for instruction by the Garden staff have multiplied far more rapidly than even the most enthusiastic of us had dared to expect.

Many of our citizens have watched with close interest the development of the Garden grounds during the last five years from a useless and unfrequented area into a most attractive place of recreation, which has added more than fifty acres to the pleasure grounds of the city and was visited last year by more than 360,000 people. Few, however, have realized the work which has been done within the very limited portion of the building completed three years ago, or have known anything of the eagerness with which great numbers of teachers and children and others have seized every opportunity which the inadequate rooms offered. Last year alone there were 2,600 registered pupils in classes with an aggregate attendance of 29,000, beside outside lectures by the staff in the public schools to over 18,000 more. Such was the demand for seeds from the school children for planting home and school gardens that 110,000 packets were put up and furnished them at one cent per packet.

The cultivation of farm gardens in backyards and vacant lots, which is now attracting universal attention, was initiated by the Garden in Brooklyn three years ago, and has progressed steadily and satisfactorily year by year, so that fortunately we are now in a position to offer to the city the services of a trained and fully competent staff to supervise the preparation, planting, and maintenance of such gardens if funds become available for the engagement of suitable assistants to work under the direction of the staff. The salary of one such assistant has already been offered as a free gift. It is perhaps well to state frankly that, without proper instruction and supervision, farm gardens are likely to have disappointing results.

A year ago a policeman noticed a middle-aged man late one evening bending over in the midst of the children's gardens at the south end of the Botanic Garden, and seemingly disturbing the earth there. His actions excited the suspicions of the patrolman, who proceeded to investigate, and found that the man was father of a boy who had started one of the children's gardens. The boy had refused the opportunity of a fortnight in the country for fear that his garden would suffer in his absence, but he had finally consented to go on the vacation on the pledge of his father that he would look after the little garden during the boy's absence. Needless to say, the officer left him to continue his work.

I now take pleasure in introducing to you Mr. A. Augustus Healy, president of the Brooklyn Institute of Arts and Sciences.

ADDRESS

By A. Augustus Healy,

President of the Brooklyn Institute of Arts and Sciences

The completion of this beautiful and commodious laboratory building which, in connection with those that have preceded it, will enable the work of our Botanic Garden more adequately to go forward, marks an epoch in the history of the Brooklyn Institute of Arts and Sciences. The dedication of these buildings, which we make tonight to the high purposes for which they have been erected, is equally impressive and significant whether viewed in its relation to the progress and expansion of the work of the Brooklyn Institute of Arts and Sciences as an organization, or viewed in the light of the great public benefit to be derived from the establishment in this great community of a well equipped Botanic Garden to which the people can freely resort for a knowledge of the wonders of plant life, and which can so efficiently supplement the theoretical instruction of the schools with the far more vivid and forcible impressions to be had from seeing the living thing, with its wonderful power to engage the attention of the young.

Thinking of it as a part of the Institute as a whole, I am re-

minded of similar exercises, held in a large tent, which attended the laying of the corner stone of the adjacent Museum Building of the Institute in December, 1895, and which were participated in as speakers by the Mayor of the City, Charles A. Schieren, Rev. Dr. Storrs, Franklin W. Hooper, Director of the Institute, Rev. Charles R. Baker, Rev. John W. Chadwick, as poet, Seth Low, then President of Columbia University, St. Clair McKelway and Rev. Sylvester Malone, all leading citizens and very prominent in the life of the city at that time. I had then but recently been elected President of the Institute and as such acted as the presiding officer at the meeting. It is remarkable, as showing what a moving caravan we are, that of the nine persons I have mentioned as having taken part in the exercises, eight have already passed to the pale realms of shade, and I alone remain. Two years later dedicatory exercises of the first section of the Museum Building were held at which the Mayor of the City was present, the principal address being given by President Eliot of Harvard. On that occasion a flag was presented to the Museum by U. S. Grant Post, of the Grand Army of the Republic. So you see, ladies and gentlemen, the Botanic Garden is following the established traditions and practice of the Institute in this formal dedication of its buildings with appropriate exercises.

At the dedicatory exercises to which I have just referred, praise was given by the different speakers to the officials of the old city of Brooklyn for the enlightened policy which had enabled them to see that the material interests of the city, no less than its moral and intellectual welfare, would be promoted by providing the means necessary for the erection and maintenance of buildings which in so eminent a degree should minister to the enjoyment and the instruction of its citizens, and they said that they did not permit themselves to doubt that the incoming administration of the government of the so-called Greater New York would have the same breadth of view in the exercise of its discretionary power. These hopes and expectations have been fully realized in these intervening years. It is true that the present most excellent administration of the city government has been exceedingly conservative and exceedingly deliberate in the granting of money for such purposes. But on the whole we have

not been disposed to complain, and have compelled ourselves to be patient, for we fully realized the difficulties under which the financial department of the city was laboring with the enormous burden which had been placed upon it for the construction of the great system of subways which are now happily advancing towards completion. Notwithstanding this, when a large contribution was generously tendered to the city from a private source towards the erection of this laboratory building, the board of estimate, under the advice of the sound business man and excellent administrator who is our present comptroller, and of our faithful and reliable borough president, saw at once the wisdom and the public advantage of accepting the offer, and immediately made the grant of funds that remained necessary for the fulfillment of the project. For all of which, our thanks. In this relation, although not germane to the subject of this evening, I may be permitted, on behalf of the Brooklyn Institute, to express the heartiest appreciation and commendation of a recent grant, from the same source, of the funds required for the completion of the large unfinished section of the museum building, on Eastern Parkway.

I cannot pass from speaking of the relation of the Institute to the Botanic Garden without referring to the remarkable man who passed from earth nearly three years ago, who was the director of the Institute for so many years, and to whom every department of the Institute owed so much at the time of its origin. It is to him that we owe the conception of a botanic garden upon these acres of land. It was as a result of his energy and enthusiasm, supported by the city government and influential citizens of the time, that legislation was obtained at Albany setting these lands apart for use as a botanic garden. It is true that nothing was done for many years towards a realization of the project, and it remained for others, still active in the work, to take it up, to organize it, and carry it forward to successful operation. In this work Professor Hooper was also enthusiastic and helpful. It remains true, and will stand to the lasting credit of Professor Hooper, that were it not for his original conception, and for his services in obtaining necessary legislation, it is doubtful whether we should have today a botanic garden.

With the completion of these new buildings the Botanic Garden is enabled, upon a larger scale and with greater efficiency, to go on with its appointed work. I can conceive of no institution likely to be of greater benefit in such a community as ours. Here nature can be studied under the open sky, or in commodious greenhouses where exotics can be maintained. A knowledge of trees, so interesting in their variety, can here be obtained. The wonderful life and habits of growing plants can here be seen in all their curious manifestations, and their manifold beauty of shape and color can be observed and admired. To those whose inclination leads them thus to pursue the study of nature in their hours of leisure a new world of marvelous interest and beauty is opened. In the Botanic Garden these advantages are freely offered to the public.

The benefit and attractiveness of the Garden to children has already been well demonstrated. The interest of growing plant life to young minds is almost universal, especially when that natural inclination is well directed. Here the nature studies of the schools become living realities. The children return to their lessons in school with far greater interest and appreciation after having come in contact with the living forms to be found in the Garden.

An advantage of the Garden of a very different and much more practical character is in its capacity to give valuable information to those who wish to raise vegetables and other kinds of food products from the land. In a year such as this, when there is a shortage of food, and when all who can are urged by the public authorities to cultivate the land to the utmost, the Botanic Garden, with the useful information and instruction which it has to offer, becomes a valuable asset and of great public importance.

While it is to be expected that in the nature of things by far the larger part of the activities of the Botanic Garden will be of the general character of those to which I have referred—that is to say, those capable of giving direct and immediate benefit to the public—may I not indulge the hope that in the quiet of the inner recesses of this building the pursuit of pure science may go on? And let us not say that those who, in the laboratory or otherwise, are engaged in such study are leading useless lives, even though

their studies be not directed to any immediate practical end, but are made simply to ascertain pure scientific truth. I remember hearing the eniment English scientist, John Tyndall, while making a plea here in Brooklyn for the encouragement of the study of pure science, say, referring to such students: "Let them alone, let them pursue their work without any thought of advantage or utility and you will find that in the end hidden truths or facts of science will be brought to light which may be of immense benefit and of great practical importance to the human race." I can understand how such might very well be the result of such study of pure science.

In conclusion I wish to congratulate the people of the Borough of Brooklyn upon the completion of this building. I wish, on behalf of our board of trustees, to thank the private citizens and public officials who have provided the means for its erection. I wish to congratulate our able and indefatigable director, Dr. Gager, upon the enlarged facilities which he will now have for his important work. I marvel that in the past he has been able to accomplish so much with so little. Finally, I may be permitted to express the hope that as a result of the enlargement of the sphere of its activities now made possible to the Botanic Garden, a large accession of new members will come to it which shall enable it greatly to widen its influence.

THE SOCIAL, EDUCATIONAL, AND SCIENTIFIC VALUE OF BOTANIC GARDENS

By Professor John Merle Coulter

It is a noteworthy fact that the United States is beginning to appreciate botanic gardens. This appreciation may be relatively superficial as yet, but the superficial is usually the preliminary step that leads to the fundamental. The desirability of Botanic Gardens was not obvious when large areas in a state of nature were available to almost every one; but when we developed congested populations in cities and made artificial most of our open areas, the thought of botanic gardens began to take form.

Those of you who have travelled in Europe must have been impressed by the multiplicity of such gardens. They began there in the form of monastic gardens, in which the so-called "simples," used in primitive medicine, were cultivated. Then they came out into the open as city gardens, chiefly for the enjoyment of the people and to beautify the city. Finally, they became also scientific, and gradually led to such great establishments as the Botanic Gardens at Rome, Geneva, and Paris, the great modern gardens on the outskirts of Berlin and Munich, and that greatest of all garden establishments, the Kew Gardens of London. These are but conspicuous illustrations of what almost every European city had developed before we began to think of garden establishments.

I wish to speak of three conspicuous contributions that such an establishment can make, not all of which are appreciated as they should be. There is no better audience for this purpose than the friends and supporters of the Brooklyn Botanic Garden, which has achieved more in certain directions than any other garden in the country. I wish you to realize, not only that your support is justified, but also that perhaps you have builded better than you knew. I shall speak of these three contributions in what I conceive to be the inverse order of their importance, in the sense that the superficial, however desirable, is less important than the fundamental.

1. The first is the *social* contribution. "Social" is a very inclusive word. Anything that contributes to the welfare of a community, in any way, is a social contribution. In this sense, the results of education and of religion are also social. I am using the word in no such general sense, however, but simply to include the betterment of city conditions for living.

A botanic garden is a social contribution because it is one answer to the problem of congestion. It is not sufficient to have open spaces, even when those spaces are beautified as parks. There cannot be too many of these, but something more is needed. I wonder if you all appreciate what the touch of nature means. It is something more than open space for breathing. It is a kind of elixir that helps men to be *men*. The Garden is a museum of nature, not merely an area left to nature. In it there are assembled the representatives of many regions, so that it gives

a world contact. It is a great service to give any community the opportunity of such a contact.

The contact with nature presently develops the contact of interest, and interests outside the routine of living, when these interests are worth while, are both curative and stimulating. Then when interest is awakened, and plants are examined as individuals, and not merely as a general population, the wonders of plant life begin to appear. I wonder how many know why leaves are green and flowers colored; why some plants are trees and others herbs; why some trail and climb, and others stand erect. All of this vegetation is the natural covering of the earth, which cities have eliminated. It is the covering that makes your lives and all life possible. I should say, therefore, that the mere presence of a botanic garden in a city is like having the spirit of nature as a guest, and all who become acquainted with this spirit are the better for it.

There is nothing more artificial than city life, and therefore nothing more abnormal. Some are able now and then to renew their contact with the natural and normal, but most are not. A botanic garden brings to the many a touch of what only the few can secure for themselves. You have doubtless developed some very definite and effective ways of expressing the social contribution of this Garden to the life and welfare of this community. But to me, speaking in general terms, the conspicuous *social* contribution is to provide the opportunity, and see to it that all the people take advantage of it.

2. The second is the *educational* contribution. It is this contribution to the community that you have developed with remarkable success. Nature is a great teacher when she really comes in contact with the pupil. The notion is too prevalent that knowledge comes from books; that one can read *about* nature and acquire knowledge *of* nature. One might just as well try to acquire knowledge of business by reading about business. Knowledge comes from experience, from contact. We must distinguish between *knowledge* and *information.* Knowledge is first-hand, obtained from actual contact with the material. Information is second-hand, hearsay, coming from no actual experience. Reading *about* nature, therefore, brings information; contact *with*

nature brings knowledge. To serve a community by bringing its children into contact with nature is a great educational service.

Perhaps the most significant contact with nature is the handling of plants. We are seeking now for an army of people with some experience in handling plants; for more people who will cultivate plants wherever space permits. You have been made to realize, in these days of testing our resources, that the most important material problem we are facing as a nation is the problem of food-production and conservation. Food-production has lagged far behind population, and this increasing gap must be closed up. Our science of transportation has far outstripped our science of food-production, so that we have come to depend not only upon a diminishing food supply but also upon transporting that supply across a continent. To learn to grow plants and to grow them everywhere, especially near our great centers of population, is a crying need.

The development of home gardens, therefore, is not merely a service for social betterment that all recognize, but it is becoming more and more a public necessity. Any institution that gives you and your children this training is not merely an educational institution, but also a public benefactor. A botanic garden doing such work is like a power house, radiating energy throughout the community. Such training is an equipment which not only enriches life, but it is also an equipment for service. In providing such an opportunity, a city can do nothing better for its young people and its homes, and through them for itself.

These two contributions, social and educational, seem very obvious, but the third contribution needs fuller explanation.

3. The third is the *scientific* contribution. This I regard as your great opportunity, and I wish to help you realize it. We are a very practical people, and unless we can see immediate returns from an investment, we decline to undertake it. Very few people appreciate what it has taken to make things practical. We speak of fundamental science and practical science; sometimes we call these two phases pure science and applied science. The general impression is that pure science holds no relation to public welfare, and that applied science serves our needs. You should know that all applied science depends upon pure science;

that there would be nothing to apply unless pure science had discovered it. If we had only applied science, it would soon become sterile. It is pure or fundamental science that keeps applied science alive, that makes progress possible. For example, if Faraday had not worked in pure science, Edison would have had no basis for his wonderful inventions. And so it is throughout the whole range of the practical things we are using today. To neglect pure science and support only applied science would be like wanting children and eliminating parents. When I hear those who are regarded as practical men lauding our practical achievements, which certainly deserve praise, but speaking lightly of work in fundamental research, I think of them as those who would praise the practical electric light and forget the impractical, because unseen, power house. Scientific research is the power house that generates all the energy we apply in developing what may be called the machinery of our civilization.

I wish now to indicate, by a single illustration, how such an institution as this may become a great laboratory for public service. My illustration is intended only to indicate how fundamental research is of the greatest service to public welfare, a source of energy to be called upon and applied as needs arise. It is not intended to indicate the specific kind of work that any given garden should undertake, this may well vary, but it is a good illustration of the value of research work in general.

I have indicated the problem of food production that our nation is facing today. In some way our food production must overtake our population. Over a century ago certain men were speculating about evolution. The subject of evolution was not a science, because men were *meditating* rather than *investigating*. Certainly nothing could have seemed farther removed from general human interest than this speculation. About a century ago, speculation about evolution merged into the science of evolution, when men began to observe the facts upon which such a theory could be based. For a century, observation and inference went on until they had reached the limit of usefulness. Near the beginning of this century, men concluded that the only way to secure further progress was to test by experiment whether one kind of plant could actually produce another kind. In observing

the behavior of plants in breeding, they began to uncover the laws of heredity; and as knowledge of these laws increased, it became evident that this knowledge could be applied to the practical handling of plants, and what we call our revolution in agriculture followed. It is a far cry from a speculation about evolution to the solution of our food problem, but the continuity is unbroken. It is by such essential and generally unrecognized service that scientific research is contributing to human welfare. I wish to be more specific, and to indicate some of the ways in which science has solved this food problem.

Through scientific work in the study of heredity, we have learned to multiply the races of our useful plants so that they may fit in more exactly to the variable conditions in which plants must be grown. It is a curious fact that we have been blind so long to the teaching of nature that conditions for plants are not the same everywhere. We have always realized that the natural vegetation of this country is not a monotonous covering. Every change in vegetation indicates a special set of conditions for plant growth, and yet we have been trying to grow the same races of plants everywhere. The result has been that we have gotten maximum returns from some areas, minimum returns from others, and medium returns from the rest. Our total result has been an average. By multiplying races of plants to fit conditions more closely, our total result will not be an *average,* but a *maximum* everywhere. This one suggestion of science will double our production.

One of the most destructive enemies of our crops is drought. On an average our production is cut in half by this enemy. Scientific investigation has shown that it is possible to develop drought-resistant races of all our useful plants. This means the possibility, not only of insuring our crops against drought where they are now cultivated, but also of increasing enormously the area of cultivation, by adding the so-called arid regions of perpetual drought.

Another destructive enemy of our valuable crops is disease. The government has expended millions of dollars in the study of plant diseases, in the hope of reducing the loss. The scientific work of recent years has shown that it is possible to breed disease-

resistant races. Plants, like human beings, differ in their susceptibility to diseases. Some are immune and others are susceptible. This means that we can cultivate immune races and let the susceptibles perish. We cannot handle human diseases in this way. Before what we speak of as the wonderful advance of medicine, we were unconsciously practising selection of the human races for immunity. The susceptibles disappeared and the immunes survived. Now medicine has been so successful that it saves the susceptibles and keeps them mixed with the immunes, so that our human problem is more difficult than it used to be. But we have no such sentiment about plants, and we can cultivate immunity and eliminate susceptibility.

I am told, by those who are trained in collecting such statistics, that if these suggestions of scientific research can be generally applied, our food production will overtake our population. It is in such ways that the results of science find application. This is not merely a local service, but a national service, and in such a time as this it is a patriotic service.

May I call your attention to the work of the National Research Council in connection with your opportunity. This Council has been appointed by the National Academy of Sciences at the request of President Wilson. Its purpose is to bring into cooperation all of our scientific equipment in an attack upon the problems we are facing. This week we have been canvassing the problems that need immediate attention, and they are to be assigned to various research centers, where properly trained men and adequate equipment are available. I want to include this Institution in these assignments. Your opportunity is an unusual one, for already you have many things that are needed. You have the opportunity to respond to this call from your country, and to see to it that research is properly provided for. Such research work not only provides what are called the sinews of war, when war becomes necessary, but it also means progress and power in times of peace. It is this opportunity that led me to say earlier in this address that perhaps you have builded better than you knew.

Do not be misled into thinking that only those problems should be attacked that have been developed by some immediate need.

Research is like the exploration of a new country. It must be traversed throughout; all trails must be followed and mapped. Some trails will lead to rich lands and valuable mines; others will not. No one can tell until everything has been explored. Your research work here should mean an exploration of nature

FIG. 9. The central rotunda, main floor, of the laboratory building. View facing east, toward the main entrance to the library. The height from the floor to the opening in the ceiling is 36 feet, 6 inches; to the top of the balustrade, 41 feet.

as represented by plants, and there is no more important region of nature. The more we know about plants, the more intelligent we become in handling them. I have known scientific explorers who discovered a new country and mapped it, but no one at the time recognized it as good for anything. Years afterwards it was discovered that it was rich in possibilities.

Years ago an Austrian monk, working in his monastery garden, discovered some interesting behavior in the plants he was breeding. He recorded his facts and his conclusions in an obscure journal, and no one paid any attention to it. What could be expected from a monk pottering in his garden? Years afterwards, the contribution was discovered, and today it is the basis of most of our work in the study of heredity, and this in turn has made our agriculture scientific. No one knows what may turn up in a garden like this one of yours. It is a gold mine of opportunity. See to it that it is cultivated.

IDEALS AND OPPORTUNITIES FOR A BOTANIC GARDEN

By C. Stuart Gager

I hold in my hand a rare and, especially on this occasion, exceedingly interesting little volume. Its title is "Address at the inauguration of the Hunt Botanical Garden, in Brooklyn, N. Y., delivered in the Athanaeum at the vernal exhibition of flowers of the Brooklyn Horticultural Society, on the evening of April 11, 1855." By Francis Vinton. Sixty-two years ago, almost to a day, was inaugurated the first effort to establish a botanic garden in Brooklyn.

Apparently no enterprise could have been launched under more auspicious circumstances. Thomas Hunt, after whom the Garden was named, endowed it with fifty thousand dollars in money, and one third of the ground which the garden was to occupy, estimated to be worth at that time ten thousand dollars. This was a large endowment and a specially munificent gift for the year 1855.

In addition to Mr. Hunt's endowment, William C. Langley, Esq., gave one third of the land and five thousand dollars in money, while Henry A. Kent, Esq., gave the remaining third of the garden plot and twenty-five hundred dollars in money. The total value of the endowment, in money and land, was thus $87,-500, or nearly $10,000 more than the endowment of the Brooklyn Botanic Garden after seven years of existence.

Said the optimistic orator on that occasion: "Let this night of the Inauguration of the Horticultural Garden, ever be the Anniversary of the successful enterprise, that, year after year, shall bless, more and more, the young and the aged, the rich and the poor, young men and maidens, old men and children, parents and friends, to the latest generation."

Alas, for the best-laid plans of mice and men! The institution, apparently so firmly established, proved to be, not a perennial, but an annual plant. At the close of one year, owing to a combination of circumstances, the land (located on Fifth and Sixth Avenues, between 57th and 60th Streets) and also the cash endowments, reverted to the original donors, and the Hunt Botanical Garden has, perhaps, never been publicly heard of in Brooklyn from that year until the present moment.

The institution whose main building we dedicate tonight, is the third botanic garden projected within the city limits of Brooklyn. The second one is designated and laid out in the original plans for Prospect Park, but so far as I can learn, its realization was never attempted.

As President Healy has already noted, the first suggestion for our institution came from the late Prof. Franklin W. Hooper, but the idea of having it administered as a department of the Brooklyn Institute of Arts and Sciences, in cooperation with the city of New York, was made by Mr. Alfred T. White, chairman of the Botanic Garden Governing Committee of the Institute trustees. Not the least of my pleasures in giving a brief address this evening is to make grateful public acknowledgment, not only of the generous gifts of Mr. White and his two sisters, but of his untiring devotion to the interests of the Garden, and his personal interest in and attention to everything that concerns its welfare, and especially its usefulness to this community.

The first rough plans for the laboratory building and plant houses were prepared by the present director of the Garden at Columbia, Missouri, in January, 1910, and submitted to the architects, Messrs. McKim, Meade & White for study and elaboration.

The appointment of the director, made in February, 1910, took effect on July 1, of the same year. On the 14th of the preceding February the Board of Estimate and Apportionment of the city of New York was requested to issue corporate stock of the city for the erection of the building, and the plans and specifications for the first section were advertised for public letting during October and November, 1911.

On January 18 the contract was awarded to Cockerill & Little Co., the lowest bidders. The building was to be completed in 150 working days from April 1, 1912. Excavation began on Apirl 8, but owing to numerous exasperating delays the Garden staff was not able to occupy the first section of the building until September 24, 1913, approximately one year after the date specified for the completion of the contract.

The work of the Garden, administered for over three years from a temporary office in the Brooklyn Museum, had reached such proportions that the small first section was quite outgrown before it was occupied. The small plant houses became greatly overcrowded, both with plants and with classes; our one lecture room and class room made it possible for us to respond to only a fraction of the demands made upon us by the schools and the general public; part of our library and thousands of specimens of our herbarium were packed away in storage, inaccessable for daily use; of laboratory accommodations we had almost none; further growth was impossible, stagnation was out of the question, for the Botanic Garden was a living institution, young and vigorous.

The state of the city's finances, resulting from the enormous cost of necessary public improvements made it necessary for the most efficient Board of Estimate and Apportionment the city has ever had, to administer the public funds with the strictest economy, making appropriations of corporate stock only for necessary or very urgent purposes. This was the situation confronting our Garden in May, 1915, when the chairman of our governing com-

mittee, realizing the urgency of our need, and believing firmly in the value of our work to this city, as well as to education and sceince in general, secured private funds to the amount of $100,000 on the condition that the city appropriate corporate stock in the same amount for the completion of our buildings, and other permanent improvements of the Garden. The terms of the gift were accepted by the city administration, the corner stone was laid just one year ago tomorrow (April 20, 1916), and tonight we dedicate the building.

One cannot help but recall at this time how very recent is the development of scientific laboratories. By whatever way you came to this building this evening you were dependent for your transportation upon an electro-magnet; electro-magnetism was discovered by Faraday in 1831, and the laboratory in which he worked was the only research laboratory then in existence. The epoch-making discoveries of the great French physiologist, Claude Bernard (about 1870), were made in the damp, unsanitary cellars of the Collège de France. It was indeed impossible, says M. Vallery-Radot, to dignify these cellars by the name of laboratories; Bernard himself called them "scientists' graves"—a prophetic name, for it was Pasteur's opinion that the disease which caused the death of Bernard was induced by the unhealthful conditions in which he was obliged to work. The laboratory of the Sorbonne was equally bad, dark and damp, and several feet below the level of the street. As late as 1871* there was no botanical laboratory of any sort in the United States. The museum and laboratory building of our sister institution, the New York Botanical Garden, completed in April, 1901, was the first building of any considerable magnitude in this country constructed for the sole purpose of botanical instruction and research.

What a change, and what an appropriate and heartening change, in the past twenty-five or thirty years, for now all of our better colleges and universities are planning adequate housing for their

* The first botanical laboratory in the United States for undergraduate instruction was introduced at Iowa Agricultural College (Ames) by the late Professor C. E. Bessey, in 1873. The laboratory method for advanced students is said to have been introduced the year previous at Harvard, but this was unknown to Bessey.

botanical work, and in many institutions this ideal has already been realized.

As many of you have already seen, the architects have made this a building of great beauty. A well-known magazine recently published a view of the Woolworth building, in New York, entitling the picture "a cathedral of commerce." And why should not commerce, and science which promotes commerce, have their beautiful buildings? Nothing has done more to give us a deep insight into divine mysteries, to correct false notions of deity, to produce a sane and wholesome attitude of mind toward the universe and man's relation thereto than the study of science, especially during the past fifty years. I like to think that there is something truly significant in the fact that the architectural motive of this laboratory building was drawn from churches such as are not uncommon in northern Italy.

But what is this building for, and what is a botanic garden? A botanic garden is an institution for the advancement and diffusion of a knowledge and love of plants; the particular purpose of the Brooklyn Botanic Garden is the advancement of botany and the service of the city.

But how, you ask, can a botanic garden serve the city? Without hesitation I reply, primarily by the advancement of botany, secondarily in many related ways. How the means indicated are adequate to achieve the result is still not clear to those who are inclined to think of botany, not as a man's work, as a science fundamental to the oldest and most essential of all human occupations, namely agriculture, but merely as a pleasant pastime for young ladies in a "finishing school," or as a rather heroic method of learning to recognize a few native wild flowers and to pronounce their Latin names. My time is too short and the hour is too late for me to go into details, but I may briefly illustrate by citing a line of work now in progress here, namely a survey of the diseases of the trees and shrubs of Prospect Park and the Botanic Garden. During the past ten years the boroughs of Brooklyn and Queens have lost chestnut trees to the value of several hundred thousand dollars through the ravages of a tree disease which no one knows how to combat. Would it not have been worth much more than the annual cost of maintenance of both botanic

gardens of the city to have known how to check the chestnut blight, and how to cope with equally destructive diseases now threatening several other kinds of trees?

But of far greater importance than a knowledge of how to grow trees in a city, or how to combat the diseases of crop plants, is the instilling in the general body of our citizens of correct habits of thought and a correct attitude of mind in the face of such problems. To observe accurately, to record faithfully, to reason logically, to keep an open mind, to welcome truth regardless of consequences, quickly to recognize error, to make no compromise with charlatanism—this is the scientific habit of thought and work. It is the only method by which knowledge is advanced; it characterizes all research in this and similar institutions; it is the indispensable spirit of all scientific instruction, both elementary and advanced; *it is the greatest educational need of today.*

Never, more than now, was our educational atmosphere so surcharged with a clamor for "efficiency," which, in many minds, is synonymous with the idea that the chief end of education is to enable one to get a living. But the scientific habit of mind, briefly outlined above, equips one, not only to get a living, but to live. To belittle the importance of equipping our youth to succeed in some vocation would be folly; it is greater folly not to recognize the importance of equipping them to spend their hours of recreation in something more wholesome and beneficial than movies and cheap vaudeville.

To educate one to think straight and to keep his thoughts in the realm of the useful and beautiful is of more fundamental importance, is more "practical," if you please, than any other end to be sought by education. The knowledge to be obtained by nature study and the study of botany is of large importance, but the by products of these studies, as here indicated, are the larger values. The work of public instruction as organized at the Brooklyn Botanic Garden affords an additional opportunity for our citizens to obtain such advantages—knowledge in which they are interested so presented as to bring pleasure, to build character, and, in many cases, to serve as the foundation of a successful life work. This is preparedness of the most thoroughgoing sort, for it not only goes to the root of things, but it serves

the nation at all times and under all circumstances, in peace as well as in war.

Two writers in a late number of *Science*,* discussing the recent debate in the House of Lords between Lord Haldane (*pro*) and Lord Cromer and Viscount Bryce (*con*) on the extension of science teaching, and the place of science in education, call attention to the fact that "science is *finding out* and *learning how*," and is not to be thought of in terms of its results. Any system of education that does not provide ample opportunity for training in finding out and knowing how is fundamentally faulty. It is the duty of every state, of every city, to see that its educational system makes suitable provision for this kind of discipline.

Such opportunities, within the realm of botanical science, are afforded at the Brooklyn Botanic Garden by our own classes, taught by members of the Garden staff, by lectures and nature stories for adults and children, and by opportunities afforded here for teachers of the public and private schools of Brooklyn to bring their pupils for a first hand study of plants in field, conservatory, and laboratory. When a boy comes to the Botanic Garden regularly every Saturday for a year or more, clear from Staten Island, a round trip journey consuming from three to three and a half hours, one may be sure that what he receives here partakes of the nature of fascination, and possesses unmeasured importance in the making of his character and in his preparation for a useful career. This is only one illuustration of many that might be given, of how our work is appealing to an increasingly large number of young people.

As a result of the present international situation there is now a widespread movement to bring all available land, especially in cities, under cultivation. This phase of preparedness was inaugurated in Brooklyn by the Botanic Garden some three years ago by the starting of back yard gardens, and the distribution of penny packets of seed. During the past three years we have distributed over 311,000 penny packets of seeds to the children of Brooklyn, and have inaugurated and inspected from 1,200 to 1,400 back yard gardens. With the more ample quarters made

* *Science*, N. S., **44**: 841–844. 15 Dec., 1916.

available by our completed building, opportunity is afforded for the expansion of this work several fold.

A brief word for scientific research and I am done. There is now nearing completion in this city one of the most stupendous works of engineering ever brought to a successful completion. I refer to the new water supply system. But what would the city say to the proposition that it should confine all of its efforts to building the conduit for this water, and should leave to some other city, or to some county, or to the state, the expense and the work of providing the reservoir and keeping it adequately supplied with water? The answer does not need to be stated.

But now transfer the simile to education. What a sorry spectacle would be an institution such as ours, calling itself educational and scientific, and yet content to be merely a conduit of information procured from a fountain head located elsewhere, and to which it made no contribution. It is the supreme—the supreme—business and duty of an institution like this, to be creative, productive; not merely a purveyor—a channel of distribution. Our debt is to science as well as to the people. We owe it to the people to disseminate knowledge; we owe it to science not to be parasitic on the body of knowledge, but organically connected with it in a relationship of mutualism—of mutually advantageous symbiosis—giving as well as receiving, constantly enriching the storehouse from which we draw. This is the only relationship which makes for healthful vigor, for perennial enthusiasm, for largest accomplishment, for the most valuable and solid service to the community. Does the great metropolis of New York wish otherwise—wish less than this for its educational and scientific institutions? I believe it does not. We are now living in the early years of an epoch when municipal support of the important work of finding out and learning how is to be considered as important and proper a function of municipal government as acquiring water sites and building aqueducts.

In a recent address on "The Support of Scientific Research in a Democracy," Professor James McKeen Cattell called attention to the fact that the manufactures of the city of Pittsburgh and Allegheny county are worth more than three hundred million dollars a year. These manufactures have all been made possible

by the applications of science. Ten per cent. of their value—thirty million dollars a year—says Professor Cattell, might to advantage be spent in that city for the future advancement of sceince under the auspices of the University of Pittsburgh. At first thought, this proposition seems as startling to the "impractical" scientist as it does to the "hard-headed" business man. But why should this not be done?

In a letter from the secretary of the board of water supply of New York City, I am informed that the land owned by New York City about the Ashokan reservoir covers a total of 15,254 acres. Six thousand of these acres are forested with so-called second growth of white oak, rock oak, red maple, sugar maple, hemlock, and white pine. The letter contains this significant sentence: "The chestnut growth is being removed on account of mortality from pests." There have been planted by the city on this watershed over 1,470,000 coniferous trees, more than 1,000,000 of which include six species of pine. The present value of these pine trees may be conservatively estimated at not less than $1,000,000 dollars, and the value increases from year to year—likewise their importance to the city's water supply. It is now common knowledge that some of these species of pine are being attacked by a fatal disease, the blister rust, recently imported into this country from Europe. Damage to the extent of hundreds of millions of dollars is known to be caused every year in this country by imported plant and tree pests. Whose concern should it be to take every possible measure to learn the nature of the pine tree blister rust which threatens property of New York City to the extent of several millions of dollars? Would it not be a perfectly reasonable business proposition to expend annually 10 per cent. of the value of the trees on the Ashokan watershed in order to ascertain effective means for the control or eradication of a tree disease which may necessitate a replanting of the entire area?

Several million dollars worth of potatoes are consumed in greater New York every year; who should be more interested than the residents of this city in supporting botanical research that has for its object the eradication of potato diseases in Maine, whence a large percentage of our supply is derived?

By the scientific and educational opportunities which it can afford our citizens, by diffusing in this community, and from this community as a center, a knowledge and love of plants, by botanical investigations in the realms of pure and applied science, the Brooklyn Botanic Garden can yearly render to the City of New York a service whose value will be far in excess of any sum of money that will ever be necessary for its annual maintenance.

At the opening of the Pasteur Institute, in Paris, in 1888, the founder of the science of bacteriology, near the close of his address, spoke as follows, smarting, as he always did, at the memory of the events of the Franco-Prussian war:

"If science has no country, the scientist should have one, and ascribe to it the influence which his works may have in this world. If I might be allowed, Mr. President, to conclude by a philosophical remark inspired by your presence in this Home of Work, I should say that two contrary laws seeem to be wrestling with each other nowadays; the one a law of blood and of death, ever imagining new means of destruction, and forcing nations to be constantly ready for the battlefield—the other, a law of peace, work, and health, ever evolving new means of delivering man from the scourges which beset him."

These words seem written for the present occasion. Almost the entire civilized world is at war, but the ultimate triumph of freedom over tyranny, of civilization over vandalism, of right over wrong, may now be confidently predicted; peace, let us hope, is not far distant. In the realm of the intellect there is perpetual conflict of light over darkness, right over wrong, knowledge over ignorance and superstition. But the strongholds of ignorance and superstition, while perpetually yielding, are eternally holding out. We shall never know it all; there will forever be ample opportunity for and need of scientific research—of the advancement and diffusion of knowledge. This is man's largest opportunity, the ultimate source of his greatest happiness.

DEDICATION EXERCISES

Exercises in connection with the dedication of the completed laboratory building and plant houses were held at the Botanic Garden on April 19–21. The weather was pleasant throughout, and the various sessions were well attended, notwithstanding many conflicts with other meetings and the absorption of public interest in activities related to the existing war situation.

On Thursday evening, April 19, the dedication exercises in the new lecture hall were followed by a reception and inspection of the building. The exhibit on genetics, in which the Cold Spring Harbor Station for Experimental Evolution (of the Carnegie Institution of Washington) cooperated, proved of general interest, and was opened to the public on the Sunday following dedication, when the building was visited by about 1,200 people, although no public announcement had been made in advance.

The scientific sessions on Friday morning and afternoon, and on Saturday morning, were well attended by visiting and local botanists, and brought to Brooklyn one of the most important gatherings of scientific men ever held in the Borough. The Garden was most highly honored by the response of botanists to its invitation to a place on the programs, most of the important universities and colleges, and other botanical centers east of the Mississippi being represented by one or more men.

After the luncheons on Friday and Saturday the guests of the Garden walked through the grounds and conservatories, inspecting the developmental work and new planting in progress.

One of the most delightful features of the exercises on Saturday afternoon was the participation of about ten members of the Boy's Club and the Girl's Club of the Garden, who told of their work here in the department of elementary instruction.

The programs of the six meetings were as follows:

Thursday Evening, April 19

8:15

Formal exercises for officials, Garden members and invited guests. Lecture Hall. Mr. Alfred T. White, Chairman of the Botanic Garden Governing Committee, presiding.

Introductory Address. Mr. A. Augustus Healy, President of the Brooklyn Institute of Arts and Sciences.

Address for the City of New York. Hon. William A. Prendergast, Comptroller.

Address: The social, educational, and scientific value of botanic gardens. Prof. John Merle Coulter, Head Professor of Botany, University of Chicago, Editor of the Botanical Gazette, Member of the National Research Council of the National Academy of Sciences.

Addresses:

For the Borough of Brooklyn. Hon. Lewis H. Pounds, President of the Borough.

For the Department of Parks. Hon. Raymond V. Ingersoll, Commissioner of Parks, Borough of Brooklyn.

For the Brooklyn Botanic Garden. Dr. C. Stuart Gager, Director of the Garden.

10 P.M.

Reception by the Trustees and Woman's Auxiliary, inspection of building, and view of exhibit on genetics, arranged in cooperation with the Cold Spring Harbor Station for Experimental Evolution of the Carnegie Institution of Washington.

Friday, April 20

10:00 A.M.

Session for the reading of scientific papers. Prof. R. A. Harper, Torrey Professor of Botany in Columbia University, presiding.

12:30 P.M.

Luncheon for invited guests.

2:00 P.M.

Session for the reading of scientific papers. Dr. N. L. Britton, Director-in-Chief of the New York Botanical Garden, presiding.

8:15 P.M.

Popular scientific program. Mr. Alfred T. White, Chairman of the Botanic Garden Governing Committee, presiding.

9:45 P.M.

Inspection of new building and of exhibit on genetics.

SATURDAY, APRIL 21

10:00 A.M.

Session for the reading of scientific papers. PROF. HERBERT M. RICHARDS, President of the Torrey Botanical Club; Professor of Botany in Barnard College, presiding.

12:30 P.M.

Luncheon for invited guests.

2:00 P.M.

Conference with teachers of biology and nature study. DR. CYRUS A. KING, President of the Department of Botany of the Brooklyn Institute of Arts and Sciences, Head of the Department of Biology of Erasmus Hall High School, Brooklyn, presiding.

3:30 P.M.

Inspection of new building and of exhibit on genetics.

4:30 P.M.

Afternoon tea, served by the Woman's Auxiliary.

The programs for the scientific sessions on Friday and Saturday were as follows:

SCIENTIFIC PROGRAMS

Friday, April 20—10 A.M.

DR. R. A. HARPER, Torrey Professor of Botany, Columbia University, presiding.

1. A. F. BLAKESLEE and B. T. AVERY, Station for Experimental Evolution, Carnegie Institution: "A vegetative reversion in Portulacca." (5 min.)
2. E. M. EAST, Bussey Institution of Harvard University: "Intercrosses between self-sterile plants." (10 min.)
3. E. C. JEFFREY, Harvard University: "Evolution by hybridization." (15 min.)

4. R. A. HARPER, Columbia University: "Binary fission and surface tension in the development of the Volvox colony." (15 min.)
5. W. J. V. OSTERHOUT, Harvard University: "The nucleus as a center of oxidation." (Read by title.)
6. MELVILLE T. COOK, Rutgers College: "Modern applications of Botany." (15 min.)
7. B. O. DODGE, Columbia University: "Mycelium of certain species of Gymnosporangium." (10 min.)
8. C. L. SHEAR, Bureau of Plant Industry, U. S. Department of Agriculture: "Pathological problems in the distribution of perishable plant products." (15 min.)
9. ARTHUR HOLLICK, Staten Island Association of Arts and Sciences: "Some botanical problems which paleobotany has helped to solve." (Read by title.)
10. WILLIAM TRELEASE, University of Illinois: "The ancient oaks of America." (Read by title.)
11. MARSHALL A. HOWE, New York Botanical Garden: "Further notes on the structural dimorphism of sexual and tetrasporic plants in the genus Galaxaura." (8 min.)
12. NORMAN TAYLOR, Brooklyn Botanic Garden: "A quantitative study of Raunkiaer's growth-forms as illustrated by the 400 commonest species of Long Island, N. Y." (Read by title.)

2 P.M.

DR. N. L. BRITTON, Director-in-Chief, New York Botanical Gerden, presiding.

1. ERWIN F. SMITH, Bureau of Plant Industry, U. S. Department of Agriculture: "The relation of crown-gall to other overgrowths in plants." (15 min.)
2. HERBERT S. JACKSON, Purdue University: "The Uredinales of Oregon." (10 min.)
3. W. H. RANKIN, Cornell University: "The importation of phytopathogenes." (10 min.)
4. GEORGE M. REED, University of Missouri: "Physiological races of parasitic fungi." (10 min.)
5. GEORGE F. ATKINSON, Cornell University: "The genus Endogone." (15 min.)

6. L. O. KUNKEL, Bureau of Plant Industry, U. S. Department of Agriculture: "A method of obtaining abundant sporulation in cultures of Alternaria solani." (10 min.)
7. N. L. BRITTON, New York Botanical Garden: "The vegetation of our new West Indian Islands." (15 min.)
8. G. P. BURNS, University of Vermont: "Weather conditions and plant development." (15 min.)
9. JOHN W. HARSHBERGER, University of Pennsylvania: "American heaths and pine heaths." (75 min.)
10. A. VINCENT OSMUN, Massachusetts Agricultural College: "Botanical training in the Agricultural College." (Read by title.)
11. GEORGE H. SHULL, Princeton University: "A duplicated leaf-lobe factor in Bursa." (12 min.)
12. EDMUND W. SINNOTT, Connecticut Agricultural College: "Isolation as a factor in specific change." (10 min.)
13. J. ARTHUR HARRIS, Station for Experimental Evolution, Carnegie Institution: "Further studies on the interrelationship of morphological and physiological characters in seedlings of Phaseolus." (10 min.)
14. O. E. WHITE, Brooklyn Botanic Garden: "Inheritance studies in Castor beans." (Read by title.)

8:15 P.M.

POPULAR SCIENTIFIC PROGRAM

MR. ALFRED T. WHITE, Chairman of the Botanic Garden Governing Committee, presiding.

1. DR. HOMER D. HOUSE, State Botanist of New York: "Photographing wild flowers for color illustrations."
2. MISS ELLEN EDDY SHAW, Curator of Elementary Instruction, Brooklyn Botanic Garden: "Vacant lot gardening and children's gardens in Brooklyn."
3. HON. GEORGE D. PRATT, Commissioner of Conservation of New York State: "Problems of conservation in New York State."

Saturday, April 21—10 A.M.

DR. H. M. RICHARDS, Professor of Botany, Barnard College, Columbia University; President of the Torrey Botanical Club, presiding.

1. JOHN M. MACFARLANE, University of Pennsylvania: "The synchronism of plant structures." (12 min.)
2. G. E. STONE, Massachusetts Agricultural College: "Contact stimulation." (15 min.)
3. H. M. RICHARDS, Columbia University: "The respiratory ratio of cacti." (12 min.)
4. R. H. TRUE, Bureau of Plant Industry, U. S. Department of Agriculture: "The absorption of calcium salts by squash seedlings." (Read by title.)
5. A. B. STOUT, New York Botanical Garden: "Duplication and cohesion in the main axis in Chicory." (10 min.)
6. W. W. ROWLEE, Cornell University: "The sequence of life in peat bogs." (Read by title.)
7. H. H. YORK, Brown University: "Some observations on the sexuality of Spirogyra." (10 min.)
8. HAVEN METCALF, Bureau of Plant Industry, U. S. Department of Agriculture: "The problem of the imported plant disease as illustrated by the White Pine Blister Rust." (Read by title.)
9. H. H. WHETZEL, Cornell University: "Outline of the history of the science of Phytopathology." (15 min.)
10. F. C. STEWART, New York Agricultural Experiment Station: "Tubers within tubers of Solanum tuberosum." (10 min.)
11. W. A. MURRILL, New York Botanical Garden: "The rosy-spored Agarics of North America." (10 min.)
12. HENRY KRAEMER, Philadelphia College of Pharmacy: "Some botanical-pharmacognostical investigations." (10 min.)
13. E. W. OLIVE, Brooklyn Botanic Garden: "The cytological structure of Botryorhiza Hippocrateae." (Read by title.)

Conference to Consider Vacant Lot Gardening and How the Botanic Garden may Become Most Helpful to Teachers.

Saturday, April 21, at 2 P.M., in the Lecture Hall

PROGRAM

Dr. C. A. King, President of the Department of Botany of the Brooklyn Institute of Arts and Sciences; head of the Department of Biology of Erasmus Hall High School, presiding.

"Welcome": Dr. C. Stuart Gager, Director of the Brooklyn Botanic Garden.

"The possibilities of vacant lot gardening in Brooklyn": Mr. H. F. Button, Professor in the New York State School of Agriculture on Long Island.

"How may the Botanic Garden coöperate with local schools?" (3 min. talks.)

Dr. Ralph C. Benedict, Bushwick High School.
Miss Beatrice King, Public School No. 25.
Miss Johanna Becker, Public School No. 36.
Dr. Frederic Luqueer, Public School No. 152.
Miss Margaret Kane, Public School No. 98.
Mr. James O'Donnell, Public School No. 43.
Mrs. Alice Ritter, Public school No. 89.

"Opportunities offered by the Botanic Garden": Dr. E. W. Olive, Curator of Public Instruction.

"What the Botanic Garden is doing for Brooklyn boys and girls." (With brief statements by ten boys and girls.)

Miss Ellen Eddy Shaw, Curator of Elementary Instruction.

Miss Jean Cross, Assistant Curator of Elementary Instruction.

Tea was served at 4:30 p.m. by the Woman's Auxiliary of the Botanic Garden.

A NEW TROPHY NEEDED

In connection with the Botanic Garden's annual children's horticultural exhibit, held each September, it has been the custom to award a trophy to the school whose exhibit wins first prize. This trophy may be retained by the school for only one year. until it has been won for the third time; it then becomes the permanent property of the school. Our first trophy, a bronze statute of Victory (illustrated in the Botanic Garden RECORD for October, 1914, p. 106, and April, 1916, p. 62), was won for the third time at the 1916 exhibit, by Public School, No. 152; it thus becomes the permanent possession of that school, and a new trophy must be provided.

An excellent opportunity is hereby afforded for any individual or organization to provide the second trophy. The first one was valued at about $50. The children's horticultural exhibit, with attendant awards, has been a means of greatly increasing the interest of schools and school children in the study of plant life and gardening, and the exhibits have improved in quality as well as in size each successive year.

The director of the Garden will be glad to give further information on the subject to anyone interested.

C. S. G.

NOTES

The Garden, in its various departments, has been unusually crowded with work during April and May in connection with the campaign to secure the planting of vacant lot gardens in Brooklyn, as a part of the preparedness work incident to the war. A full account of this work by the Garden will be given in a subsequent number of the RECORD.

It is gratifying to note that the plans for the grounds of Ohio State University, Columbus, provide for a small botanic garden.

On May 8 the Neighborhood Association Settlement Workers, Brooklyn, visited the Garden under the guidance of Dr. Gundersen.

Mr. J. J. Levison, M.F., arboriculturist of the Department of Parks of Brooklyn, and lately forester to the city of New York, announced his resignation on April 1, 1917. He will now devote his entire time to private practice as consulting landscape forester and arboriculturist. His address is Sea Cliff, N. Y.

From May 14 to June 1 Teachers College, of Columbia University, gave a series of special short courses dealing with various aspects of educational, social, and practical emergency work during the time of war. Students of the School of Education and the School of Practical Arts of the College, who attended emergency courses three or more hours a day for ten days were excused from examinations in all courses in which they had a passing standing on May 12. The course in *Educational and Practical Problems of Gardening* was given by Miss Ellen Eddy Shaw, of the Botanic Garden staff. The course aimed to meet the needs of those interested in the cultivation of their own gardens, or of those wishing to coöperate with the plan for cultivating vacant city lots by directing groups of boys and girls.

On Saturday, May 5, Dr. Gager addressed the Botanical Society of Pennsylvania on "The aims and objects of the Brooklyn Botanic Garden." The occasion was the general meeting of the society, which was held at Panhurst, on the grounds of Mr. Roberts Le Boutillier, Wayne, Penn., near Philadelphia. A basket luncheon preceded the program. After an inspection of Mr. Le Boutillier's planthouses and grounds, including a Japanese Garden, supper was served by Mr. and Mrs. Le Boutillier to the officers and speakers.

The Committee on Grants for Research, of the American Association for the Advancement of Science, met in Washington on April 15 and 16, 1917. Among grants made in various sciences, three were for botanical research, including a grant of one hundred dollars to Dr. R. C. Benedict, resident investigator at the Brooklyn Botanic Garden, for the continuation of his studies of variation in the Boston fern. The other two were to Prof. H. M. Richards, Barnard College, Columbia University, for the continuation of his investigation of the physiology of succulent plants, at Carmel, Calif., and to Prof. C. H. Kauffmann, Uni-

versity of Michigan, to aid in his studies of the fungus genus, *Cortinarius.*

The Garden Library is now receiving the *Official Bulletin,* published daily under order of the President by the Committee on Public Information. This committee, comprising the Secretaries of State, War and Navy, and a civilian chairman (Mr. George Creel), was appointed by President Wilson on April 14, 1917. The issue of May 15, under the caption, "No Seed for Distribution," contains the following paragraphs:

"No seed for free distribution nor for sale is at the disposal of the United States Department of Agriculture. The department, however, through its committee on seed stocks, is receiving daily telegraphic and other reports as to available supplies of seeds of crops for late planting, and will assist in locating seed stocks for localities where shortages exist. The committee is coöperating with state, local and commercial agencies in an effort to secure better distribution of seed and to encourage plantings of all important crops."

"Information regarding shortages and surplus stocks should be addressed to R. A. Oakley, chairman committee on seed stocks, United States Department of Agriculture, Washington, D. C."

Notice was received on March 21, from E. Bartholomew, of the discontinuance of the publication of his *Fungi Columbiani* with the distribution of Century 51. This valuable series was begun in 1893 by J. B. Ellis and B. M. Everhart, Newfield, N. J., by whom the first fourteen centuries were issued. Century 15 was issued by Dr. C. L. Shear, Washington, D. C., and Centuries 16–51 by Elam Bartholomew, Stockton, Kan. There is a complete series in the cryptogamic herbarium of the Garden.

On April 26 the department of botany of the Department of Education of the Brooklyn Institute visited the Garden, and were conducted through the buildings and grounds by Dr. Gundersen. The attendance was about forty.

Among those in attendance at the dedication exercises, April 19–21, the following are registered in the visitor's book:

George F. Atkinson,
Billings L. Avery, Jr.,
H. H. Bartlett,
A. F. Blakeslee,

Helene M. Boas,
Elizabeth G. Britton,
N. L. Britton,
Jean Broadhurst,
Gertrude S. Burlingham,
George P. Burns,
G. P. Clinton,
Mel. T. Cook,
B. O. Dodge,
Edward M. East,
J. S. Friedman,
Arthur J. Harris,
Robert A. Harper,
John W. Harshberger,
Marshall A. Howe,
H. S. Jackson,
E. C. Jeffrey,
Henry Kraemer,
L. O. Kunkel,
Michael Levine,
Wallace Goold Levison,
John M. Marfarlane,
Henry F. A. Meier,
Barrington Moore,
W. A. Murrill,
C. R. Orton,
W. H. Rankin,
M. V. Reed,
Geo. M. Reed,
Herbert M. Richards,
J. A. Samuels,
E. S. Schultz,
Fred J. Seaver,
C. L. Shear,
Geo. H. Shull,
Edmund W. Sinnott,
Erwin F. Smith,
F. C. Stewart,
A. B. Stout,
George E. Stone,
H. W. Thurston, Jr.,
R. E. Torrey,
Paul A. Warren,
H. H. Whetzel,
H. Wolcott,
Percy Wilson,
H. H. York.

The third annual spring inspection of grounds, buildings, and collections, by trustees, members of the Garden, and their friends, was held on May 22. On account of the unseasonable low temperature, tea was served by the Woman's Auxiliary in the rotunda of the laboratory building, instead of in the Japanese Garden, as originally announced.

Mr. William H. Darling, the first engineer of the heating plant of the Botanic Garden, and in continuous service from October 1, 1913, to January, 1917, died on Friday, June 1. Funeral services were held at his late residence, 1347 Bushwick Ave., Brooklyn, on Monday evening, June 4. Mr. Darling was a veteran of the Civil War, and a most faithful and valued employee of the Garden.

Woman's Auxiliary.—The Woman's Auxiliary of the Brooklyn Botanic Garden was organized on March 15, at the residence of Mrs. Alfred T. White, 40 Remsen St. The need of such an organization has been felt by the Garden for some time, and its

value was especially evident during dedication week, and again on the occasion of the annual spring inspection. Interest in the work of the Garden is increasing and spreading, and through the Woman's Auxiliary an opportuntiy is afforded of organizing this interest to the mutual advantage of the Garden and its loyal friends. The officers of the auxiliary are as follows: President, Mrs. H. B. Spelman; Secretary and Treasurer, Mrs. Thomas D. Hewitt.

White-Pine Blister Rust.—On account of the spread of the white-pine blister rust, the Secretary of Agriculture, under date of April 21, 1917, has issued the following:

"The fact has been determined by the Secretary of Agriculture that a plant disease known as white-pine blister rust (*Peridermium strobi* Kleb.), not heretofore widely prevalent or distributed within and throughout the United States, exists in Europe and Asia, and may be brought to the United States on currants and gooseberries (*Ribes* and *Grossularia*).

"Now, therefore, I, David F. Houston, Secretary of Agriculture, under authority conferred by section 7 of the act of Congress approved August 20, 1912, known as 'The Plant Quarantine Act' (37 Stat., 315), do hereby declare that it is necessary in order to prevent the further introduction into the United States of the white-pine blister rust, to forbid the importation into the United States from each and every country of Europe and Asia of all species and varieties of currants and gooseberries (*Ribes* and *Grossuularia*).

"On and after June 1, 1917, and until further notice, by virtue of section 7 of said act of August 20, 1912, the importation from each and every country of Europe and Asia of all species and varieties of currants and gooseberries (*Ribes* and *Grossularia*), except for experimental or scientific purposes by the Department of Agriculture, is prohibited.

"Notice of Quarantine No. 7 is amended accordingly."

Under date of May 1, 1917, there was also issued the following:

"AMENDMENT NO. 1 TO NOTICE OF QUARANTINE NO. 26
"*White-Pine Blister Rust*

"The fact has been determined by the Secretary of Agriculture that it is necessary, in order to prevent the further spread of a dangerous plant disease known as the white-pine blister rust (*Peridermium strobi* Kleb.), not heretofore widely prevalent or distributed within and throughout the United States, to quarantine immediately the States of Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, and Connecticut.

"Now, therefore, I, David F. Houston, Secretary of Agriculture, under the authority conferred by section 8 of the plant quarantine act of August 20, 1912 (37 Stat., 315), as amended by the act of Congress approved March 4, 1917 (Public No. 390, 64th Cong.), do hereby amend Notice of Quarantine No. 26, promulgated April 21, 1917, effective on and after June 1, 1917, and by this amendment do order that from and after the date thereof no five-leafed pines or black currant plants shall be moved or allowed to move interstate to points outside the area comprising the States of Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, and Connecticut."

On May 31, 1917, three scouts from separate troops, all students at the Brooklyn Botanic Garden, passed a test necessary for Garden certificates in tree study with unusual credit. Scout James B. McFarlin, Troop 24, recognized 106 different species of trees and shrubs; Scout F. LeRoy Scovill, Troup 68, recognized 66; and Scout Julius L. Friedman, Troup 17, recognized 53. The class was in charge of Mr. Stoll, of the Garden Staff.

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PUBLICATIONS

OF THE

BROOKLYN BOTANIC GARDEN

RECORD. Established January, 1912. An administrative periodical, issued quarterly. Contains, among other things, the annual report of the director and heads of departments, special reports, announcements of courses of instruction, miscellaneous papers, and notes concerning Garden progress and events. Free to members of the Garden. To others one dollar a year; 25 cents a copy.

CONTRIBUTIONS. Papers originally published in botanical or other periodicals, reissued as "separates," without change of paging, and numbered consecutively. This series includes occasional papers, as well as those embodying the results of research done at the Garden, or by members of its staff or students. Twenty-five numbers constitute one volume. Price 25 cents each, $5.00 a volume.

6. *Intermingling of perennial sporophytic and gametophytic generations in Puccinia Podophylli, P. obtegens and Uromyces Glycyrrhizae.* 15 pages, 1 plate. 1913.

7. *Studies of teratological phenomena in their relation to evolution and the problems of heredity. I. A study of certain floral abnormalities in Nicotiana and their bearing on theories of dominance.* 14 pages, figs. 4. 1914.

8. *Some observations on the formation of the capillitium and the development of Physarella mirabilis Peck and Stemonitis fusca Roth.* 15 pages, 2 plates. 1914.

9. *The growth-forms of the flora of New York and vicinity.* 9 pages. 1915.

10. *Inheritance studies in Pisum. I. Inheritance of cotyledon color.* 18 pages, 4 tables. 1916.

11. *Studies of teratological phenomena in their relation to evolution and the problems of heredity. II. The nature, causes, distribution and inheritance of fasciation with special reference to its occurrence in Nicotiana.* 29 figures, 30 tables. 1916.

12. *Endemism in the flora of the vicinity of New York.* 10 pages. 1916.

13. *The origin of new varieties of Nephrolepis by orthogenetic saltation. I. Progressive variations.* 28 pages, 6 plates. 1916.

14. *A white cedar swamp at Merrick, Long Island, and its significance.* 10 pages, 5 plates. 1916.

15. *Present status of the problem of the effect of radium rays on plant life.* 8 pages. 1916.

16. *Flora of the vicinity of New York.* 6 pages, fig. 1. 1917.

17. *Endophyllum-like rusts of Porto Rico.* 9 pages, 3 plates. 1917.

GUIDES to the collections, buildings, and grounds. Price based upon cost of publication.

LEAFLETS. Established April 10, 1913, and published weekly or biweekly during April, May, June, September, and October. The purpose of the Leaflets is primarily to give announcements concerning flowering and other plant activities to be seen in the Garden near the date of issue, and to give popular, elementary information about plant life for teachers and others. Current numbers free to all who wish them. Back series complete, 50 cents each; back numbers, 5 cents each.

SEED LIST. Issued in December of each year.

AMERICAN JOURNAL OF BOTANY. Established January, 1914. Published, in cooperation with the BOTANICAL SOCIETY OF AMERICA, monthly, except during August and September. Subscription rates: to members of the Botanical Society of America, $3.00 a year; to all others $4.00 a year.

BROOKLYN BOTANIC GARDEN

RECORD

VOL. VI OCTOBER, 1917 No. 4

EDITED BY

C. STUART GAGER

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DR. O. E. WHITE, *Curator of Plant Breeding*

MISS ELLEN EDDY SHAW, *Curator of Elementary Instruction*

MISS BERTHA M. EVES, *Secretary*

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_____, *Garden Aid*

MR. HERMAN KOLSH, *Foreman*

McKIM, MEAD & WHITE, *Architects*

OLMSTED BROS., *Landscape Architects*

FIG. 10. War gardens in front of the laboratory building, 1917. See page 152.

THE BROOKLYN INSTITUTE OF ARTS AND SCIENCES

BROOKLYN BOTANIC GARDEN

RECORD

VOL. VI October, 1917 No. 4

HOW CAN I HELP THE BROOKLYN BOTANIC GARDEN?

One of the most gratifying features in the work of developing the Brooklyn Botanic Garden has been the steady increase of friends intelligently and sympathetically interested in its various activities. This growing body of friends, or constituents, is the Garden's most valuable and most valued asset.

From these friends contributions of money have been received from time to time varying in amounts from Two Dollars to One Hundred Thousand Dollars. Other valuable contributions have taken the form of books, pamphlets, autograph letters and manuscripts for the library, specimens for the herbarium, medals, portraits and bas-reliefs of noted botanists, living plants for the conservatories and plantations, ornamental and art objects, such as sun dials, bird baths, images, stone lanterns, et cetera.

The most pressing need of the Garden is an increase in endowment sufficient to insure an annual income more nearly adequate to our expanding work, and the increasing demands made upon us by the public. An annual income from private funds of $25,000 would be barely sufficient to meet our present (1917) needs, outside of the cost of annual maintenance provided for in large part, but not wholly, by municipal appropriations.

The completion of our laboratory building makes it possible for us greatly to extend our scientific and educational work, provided sufficient funds for these purposes become available.

The Garden may reasonably look for additions to its endowment from two sources—gifts and bequests.

The main purpose of this statement is to suggest ways in which friends of the Garden may express their appreciation of our work even though they may not feel in a position to contribute to an endowment fund. The following suggestions offer a wide range of choice:

1. *Membership in the Garden.*—Information as to classes and privileges of membership may be obtained by addressing the Director. A membership has a double value, for in addition to the receipt of membership dues, the Garden feels that it has, in its members, a local constituency giving moral as well as material support to its work.

2. *Plants for the Conservatories and Plantations.*—The rearrangement of private conservatories and grounds often reveals duplicates of tropical or sub-tropical plants, and of hardy trees and shrubs which would fill gaps in our collections, or be specially welcome for other reasons. In many cases the Botanic Garden will be able to offer valuable material in exchange. Twice, during 1917, the closing of private conservatories has been made an occasion by the owners of presenting to the Garden valuable specimens, either new to our collections or duplicates which we can utilize to advantage in exchange.

Saxatile forms for our rock garden, native wild flowers, orchids, and rare trees and shrubs may be mentioned in this connection. Further information concerning our needs, and plants available for exchange, may be had by addressing the director of the Garden.

3. *Special Collections for the Plantations.*—Among the special collections desired may be mentioned the following:

(*a*) *Lilacs.*—The lilac collection has already been started, with about 130 varieties, but the present nucleus could be easily doubled in number of varieties.

(*b*) *Peonies.*—There are about 25 botanical species and 300 varieties of peony; they are beautiful plants, and a peony garden would make an attractive and popular addition to our grounds.

(*c*) *Roses.*—The beauty of a rose garden and the large public interest attaching to it are well known. Such collections do

much to stimulate an interest in plants and in gardening, and are often a source of valuable suggestions to owners and landscape gardeners as to the effective use of shrubs and other plants in the treatment of private places and small parks.

(*d*) *Iris.*—The brook and lake, and grounds adjacent thereto, afford an ideal condition for a collection of iris. Only a few botanical species are at present planted. Scores of species and hundreds of varieties could be grown.

(*e*) *Rhododendrons and Azaleas.*—An area with north-facing slope, near the Malbone St. gate, and adjacent to the terminal pool of the brook has been reserved for the azaleas. Provision has been made around the lake for the rhododendrons.

(*f*) *Water-lilies.*—There are about 40 species, and a large number of varieties and hybrids. Many of them are hardy in this climate. About fourteen species are now (1917) growing in the Garden lake

(*g*) *Spiraeas.*—About one half of the 50 or more species are hardy in Brooklyn. Several species are already represented in our collection. Many valuable horticultural varieties would be a useful collection for landscape architects and gardeners to study.

(*h*) *Hawthorns.*—Specialists differ widely in the number of species assigned to this difficult genus (*Crataegus*). In addition to the indefinite number of botanical species there are a large number of very beautiful horticultural froms of foreign and American species. These shrubs and trees, like the spiraeas, are specially valuable from the point of view of landscape gardening.

(*i*) *Tulips.*—Of the scores of horticultural forms only very few, used in formal bedding, are familiar to the general public. Both tender and hardy forms are desired.

(*j*) *Dahlias.*—Between 2,000 and 3,000 names of varieties have been published in trade catalogs. The Botanic Garden has not yet taken any steps toward a dahlia collection.

(*k*) *Conifers.*—Valuable for their landscape effect as well as for botanical interest.

4. *Books for the Library.*—Especially desired are complete sets of botanical periodicals. Such sets become more rare and more expensive each year.

5. *Specimens for the Herbarium*—To properly name the col-

lections of living plants large additions to the herbarium are needed, especially from the tropics and the south temperate zone. Other scientific needs of the Garden demand additional herbarium collections.

6. *Medals for the Children's Work.*—Properly handled, the award of medals and buttons may be made a healthy stimulus to nature study and more advanced botanical work by young people. Such has been the case at the Brooklyn Botanic Garden, where the amount of plant study undertaken voluntarily by boys and girls of 12–18 years of age, outside of school hours, and in addition to school requirements, has been truly surprising and peculiarly gratifying. So far, for the purchase of buttons and medals, the Garden has been totally dependent on income from the sale of penny packets of seeds, and on very limited receipts for tuition.

To one interested in the education of children along the line of nature study nothing could give more satisfaction than to stimulate such work by a gift of inexpensive tokens for work well done. The cost of these bronze and silver medals and exhibitors' celluloid buttons is about $150 a year. Full information may be had by addressing either the director of the Garden, or the curator of elementary instruction, Miss Ellen Eddy Shaw.

7. *Trophy and Cups.*

(*a*) *First Trophy.*—At the annual Children's Garden Exhibit, held in September, a trophy is awarded to the school, public or private, that has the best exhibit of garden products (flowers and vegetables) raised by its pupils. The trophy becomes the permanent property of the school that wins it three times. A new trophy must be provided for the 1917 exhibit. The first trophy, a bronze statuette of Victory, was won for the third time at the 1916 exhibit, by Public School 152, Brooklyn, and has therefore been presented to that school. The cost of a suitable trophy will be about $50.

(*b*) *Second Trophy.*—Many schools, notably those in the more congested parts of the city, will never be able to compete for the trophy offered for garden products. In order to stimulate the raising of plants, even under difficulties, and to encourage schools unfavorably located, the Botanic Garden hopes to be

able to offer in the fall of 1917, a second trophy for the best School Roof-Garden Display. The cost of this trophy will be about $25.

(*c*) *Cups.*—Three silver cups are offered, as follows:

(1) As first prize to the school making the best *box garden or potted plant display.* (About $10.)

(2) As second prize to the school making the second best *garden display.* (About $8.)

(3) As second prize to the school making the second best *roof garden display.* (About $8.)

(4) As second prize to the school making the second best *box garden and potted plant display.* (About $8.)

8. *Rose Arch,* at the main entrance to the Children's Gardens. Four plants of "Dorothy Perkins" rose, presented for this arch by the Mother's Club of Public School 81, Queens, were planted on June 20, 1917. A suitable arch can be provided for approximately $10–$15.

9. *Flags and Flagpoles.*—Two flagpoles and national flags are needed, one for the children's gardens, and one to be placed near the main laboratory building. It is also desirable for the Garden to have a New York City flag about 5 ft. × 7 ft. in size.

10. *Garden Seats.*—Park benches should be provided by municipal appropriation, but in addition to them it would add much to the Garden in the way of beauty and interest, to have a number of ornamental stone seats, contributed by organizations as evidence of their appreciation of the Garden, or given in memory of some well-known botanist or some benefactor of the Garden.

11. *Drinking Fountains.*—One is urgently needed now at the children's gardens. It is very desirable to have three or four others at widely separated points in the garden.

12. *Busts* of noted botanists and of benefactors of the Garden. Such works of art will not only contribute to the beauty of the grounds, but will add to their educational value.

The above suggestions should appeal to various organizations, such as mother's clubs and other women's clubs, teachers' organizations, patriotic and social clubs of men, as well as to indi-

viduals. The Botanic Garden is rapidly coming to be recognized as an invaluable educational institution in Brooklyn, and the objects listed above are more appropriately provided by private funds than by public taxation. Copies of the *Annual Reports,* and of the *Booklet of Information* about the organization and activities of the Garden may be had for the asking. The Director will be glad to confer personally or to correspond with any one concerning any of the above items.

PLAN OF FURTHER DEVELOPMENT

The following outline of plans for the further development of the Brooklyn Botanic Garden in the immediate future is reprinted from a circular issued last spring over the names of the president of the Institute, the chairman of the Botanic Garden governing committee, the chairman of the Woman's Auxiliary, and the director of the Garden. It is reprinted here for purpose of record, and also for wider publicity.

Program of Development

1. To complete the grading, initial planting, and general layout of nearly fifty acres of land, according to the plans of the landscape architects.

2. To maintain the rock-garden. This garden, constructed in 1916, with funds provided in part by the City and in part by private gift, is the only rock-garden in any public park in Greater New York.

3. To enlarge our collection of native wild flowers. The local flora section of the Botanic Garden now has growing between 800 and 900 species, native within 100 miles of Brooklyn. It is desired to exhibit larger groups of each species now in the collection, and to add all other species that can be made to grow in the habitat of the Garden.

4. To extend the purely ornamental planting, and other ornamental treatment of our grounds.

5. To enlarge the lilac collection and install other special collections. The lilac collection contains at present about 130 varieties. This number may be more than doubled.

6. To build up our collection of tropical and sub-tropical plants in the conservatories, and to extend our general systematic collection of herbs, shrubs, and trees not native within 100 miles of Brooklyn.

7. To maintain our Japanese garden. This garden, pronounced by competent critics, both Japanese and American, to be unsurpassed in America, was constructed entirely with private funds at a cost of over $11,000.

8. To extend and improve our educational work with children, based on a study of plant life. In 1916 the attendance of children in all courses offered at the Garden was nearly 18,000. Considering that attendance at many of these courses is wholly voluntary, and is consecutive for each child for periods varying from six weeks to six months, this attendance is striking evidence of the demand for this work, as well as of its value and interest for the child. Our work of public instruction, including *extra mural* lectures, reached a total of over 40,000 children and adults during 1916.

9. To increase our educational opportunities for adults. An important phase of this work is our year's course for the preparation of teachers of gardening. The need of adequately prepared garden teachers, both locally and throughout the country, is far greater than the supply.

10. To cooperate with the public and private schools of the city in improving their instruction in nature study and botany. Over 8,500 pupils of Brooklyn schools visited the Garden in classes, accompanied by their teachers, in 1916, an increase of more than 1,900 over 1915.

11. To extend our opportunities for botanical investigation by the establishment of research fellowships and curatorships, and by providing the necessary equipment for such work.

12. To complete the plant disease survey of the trees and shrubs of Prospect Park, begun in 1916. The information obtained by such a survey will be freely placed at the disposal of the Park Department. The entire expense must be met by private funds. In addition to rendering a valuable service to the city, this survey will, no doubt, result in a substantial contribution to our knowledge of the causes and control of plant diseases, and especially those of woody plants.

13. To enrich our botanical library so that it may adequately serve the needs of a first-class scientific institution, as well as of the general public. At least $5,000 could be expended at once for publications urgently needed. The total value of the publications in our library on December 31, 1916, was nearly $17,000, all of which has been provided from private sources during the past six years.

14. To provide for the growth of our herbarium so that it may serve the increasing needs of a Botanic Garden having large collections of living plants.

15. To afford better facilities for botanical publication, both technical and popular. The need of enlarged opportunity for publishing the results of botanical research is very urgent. The *American Journal of Botany* (published by the Garden in cooperation with the Botanical Society of America) should appear twelve months a year instead of ten, as now, and the number of pages should be greatly increased. The Garden also needs funds for the publication of scientific *Memoirs,* as well as for its very popular *Leaflets.*

16. To increase the present endowment fund from $78,500 to not less than $500,000. The amount expended from private funds in 1916, merely

to meet the most urgent needs of the Garden, was over $14,000, and the demands increase from year to year. To insure an annual income of this amount, and to provide for normal expansion and enrichment of the Garden's activities, an endowment of $500,000 is urgently needed.

17. To increase the membership of the Garden. The Botanic Garden is a private organization, cooperating with the City of New York in the development and maintenance of a botanic garden in the Borough of Brooklyn. Certain phases of our work should be, and are, maintained by public taxation, but other phases of our work must be maintained by private funds. The Borough of Brooklyn has a population of nearly 2,000,000 people; *less than 200 of these contribute anything toward the private funds needed for the purposes to be met from such a provision.* Over 362,900 persons visited the Garden in 1916, and the number of visitors is constantly increasing. There should be at least 2,500 members.

Do you believe that a botanic Garden is a desirable thing for Brooklyn? If so, we invite your substantial cooperation in its development, so that it may be made of greatest usefulness to the city, as well as to education and science in general, and may become one of the foremost causes for civic pride, not only in Brooklyn, but throughout the Greater City.

You are invited to visit our buildings and grounds, and the director will be glad to give further information as to our organization, our aims, and our activities.

WAR GARDEN SERVICE OF THE BOTANIC GARDEN

Early in April, 1917, there was formed, in the rooms of the Brooklyn Civic Club, a Brooklyn Garden Committee, to organize and supervise the planting and cultivation of vacant lots and back yards in Brooklyn, in connection with the nation-wide movement to increase the food supply by enlarging the area of cultivated ground. The committee included Mr. A. M. Lopez (Brooklyn Bureau of Charities), chairman, Mrs. Lillian W. Betts (Parks and Playgrounds Association), secretary, Hon. Raymond V. Ingersoll (Commissioner of Parks), Dr. Gager, of the Botanic Garden, and seventeen others. A special contribution from the chairman of the governing committee of our trustees enabled the Garden to offer all of the time of our head gardener, so far as needed, to make preliminary inspections of plots, confer and advise with prospective planters and make inspections of gardens during the summer. Requests were received and met for the inspection of 139 gardens, varying in size from one hundred square feet to twenty-two acres. The gardens were located in all parts of

the borough, and we are indebted to Commissioner Ingersoll for the loan of the Park Department automobile, which greatly facilitated the work.

On the Botanic Garden grounds, besides our regular children's gardens of 264 plots, each 6 ft. × 8 ft., there have been cultivated by older boys and girls and by adults, including the teachers' training class, 10 plots 8 ft. × 10 ft.; 60 plots 10 ft. × 20 ft., and 17 plots 20 ft. × 40 ft. or larger.

In addition to the above a model small vegetable garden, 20 ft. × 40 ft., was planted in April and has been maintained during the season. The planting was made a public demonstration, and was attended by a large number of adults. A motion picture of the occasion was also taken by the Hearst-Pathé news service.

For the advantage of boys of high-school age who wished to fit themselves to be of service on the farm a special course in gardening was organized in May, under the direction of Mr. Stoll, of the Garden staff. Twenty-two plots were assigned, each 20 ft. × 40 ft., on the area immediately in front of the laboratory building, designed ultimately to be laid out as a formal plaza.

Every employee of the Garden was offered a plot 20 × 40 ft., to be planted and cared for outside of Garden hours, and about ten of the men took advantage of this offer.

The policemen whose post includes the Botanic Garden signified their desire to cultivate a plot of ground, and a considerable area was assigned them on the north addition, between the museum building and Mt. Prospect reservoir.

Finally the land on the east side of the brook, on the south addition, which it was planned to put into lawn last spring and incorporate in the general systematic section, was planted to potatoes. This crop, like others, suffered greatly from the protracted drought of late July and August.

In addition to the above gardening operations the Botanic Garden served as the distributing agent of seed potatoes for Brooklyn for Mayor Mitchel's Food Committee, of which Mr. George W. Perkins was chairman. The potatoes were secured through Mr. M. Maurice Eckstein, supervisor of purchases for the United Fruit Co. About 148 bushels were thus distributed, at a cost of $2.84 a bushel. The current market price averaged about $4.00.

Besides answering innumerable requests for garden information received by telephone and by personal calls at the Garden office, the Garden prepared five *Leaflets* on the following subjects: (Figures in parentheses indicate the number of copies issued, the regular issue being about 1,000) *The small vegetable garden* (3,500), *Some insect pests* (3,000), *The storage of vegetables* (1,500), and *The one-period cold-pack method of canning* (3,000), *Fall treatment of land for garden crops* (3,000).

The figures just given are specially significant, for the *Leaflets* were not distributed broadcast, but only to those who asked for them. It is very easy to roll up much larger (in fact, almost unlimited) figures as to free distribution of pamphlets and other printed matter, but when they are handed out indiscriminately, unasked, or placed in trolley cars and other public places, many are promptly thrown away, often without even being read. This happened time and again at various meetings held last spring in Brooklyn and other boroughs. We feel that every one of the Garden *Leaflets* was handed to a person who wished the information it contained. The *Leaflets* are financed from private funds, and contributions would be gratefully received for their continuance.

C. S. G.

A TRIP TO TEXAS TO INVESTIGATE COTTON RUST

On July 23, 1917, I was asked by Dr. W. A. Orton, pathologist in charge of cotton, truck and forage crop disease investigations, to undertake for the U. S. Department of Agriculture an investigation of a sudden outbreak of cotton rust in southern Texas. This disease was supposed to have originated across the Mexican border and it was feared that if not checked it might sweep across the whole southern cotton belt, doing a great deal of damage.

The Federal Horticultural Board, of which Dr. Orton is a member, was much concerned over this new menace to the cotton industry, especially in view of the fact that the Board has just been considering the establishment of a cotton-free zone along insect pest, the pink boll-worm, which is now established in the Rio Grande valley, looking to the exclusion of a serious

certain parts of northern Mexico. The threatened invasion of another new cotton disease in the shape of the rust had, therefore, really great and wide-reaching significance.

I left Washington, Tuesday, July 24, 1917, and arrived at Mission, Texas, near the center of the infested region, on Friday, July 27. I was met at Pharr, Texas, by Dr. John J. Morton, resident agent of the U. S. Department of Agriculture, who was responsible in the first place for calling the attention of federal and state authorities to the serious nature of the cotton rust disease. Dr. Morton showed me every courtesy and many times went far out of his way to help me in my investigations.

Under the guidance of Dr. Morton, I spent the afternoon and part of the following day driving about the country around Mission, getting acquainted with the extent of spread of the disease and the possible damage resulting from it. Since the yellow rust stage on the leaves of the cotton had died down and ceased to spread about three weeks to a month before my arrival in Texas, and since the plants on which I found the remnants of the disease seemed to have recovered in large part from the results of the infection, I found it difficult if not impossible for me to make any reliable estimate of damage. I found, however, abundant indications that a serious epidemic must have occurred. A comparatively few of the lower leaves of many cotton plants still showed old infections, most of them dead, some of the spots as large as a dime or even larger having fallen out, leaving holes in the leaf. The most convincing evidence, however, of the serious nature of the disease was furnished by the abundance of dead leaves often found lying on the ground between the rows. These showed old rust spots, sometimes a dozen or more to the leaf, and had evidently fallen from the plants as a result of the rust infection. Such defoliation resulting from a spring-rust, or aecidium, stage is, in my experience, exceedingly rare.

Dr. Morton's observations, extending over the time of greatest virulence of the rust attack (toward the end of June), led him to the following conclusions. The area covered by the epidemic extended east and west from about Sam Fordyce to San Juan, a distance of about thirty-six miles, and from the Rio Grande north about fifteen miles. He estimated the damage in this area

as averaging about 20 per cent. loss in cotton. In place of more severe infection he placed the damage at about 70 per cent.

Since the rust epidemic on cotton had entirely ceased some time before my arrival, there remained only two things for me to do with reference to the disease: to search for the possible alternate host and to look for other possible centers of cotton infection.

In regard to the latter, I examined cotton at Mercedes, Kingsville and Falfurrias, Texas (where Drs. Heald and Wolf had collected *Aecidium gossypii* on September 14, 1909*), but I did not find any evidence of the rust.

The major portion of my time in the valley was therefore spent in searching for rusted grasses, etc., especially in the area of this year's cotton rust epidemic. Besides collecting rusted grasses in and about Mission, I also collected grasses, rusted and otherwise, outside the area of known infestation, at Mercedes, Kingsville and Falfurrias. I had hopes by so doing of finding hints as to the possible alternate host by the process of elimination. If some grass hosts were found to be abundantly rusted in the critical area around Mission and not rusted about Mercedes, for instance, we could draw the conclusion that one or more of these grasses might serve as the alternate host of the cotton rust.

About six or seven grasses and about three or four other kinds of host plants were found at Mission to bear rusts. Only about three or four rusted grasses and a few other hosts bearing rusts were collected at Mercedes and other stations. These remain to be critically examined. I hope to be able by these studies to obtain a more reliable basis for culture studies next spring in order to establish beyond doubt the alternate host of cotton rust, if there be any. I might add here that I was too late on the ground to obtain reliable evidence as to whether the cotton rust might be short-cycled. From the slight evidence which I have at hand, I should hazard the guess that the cotton rust is not short-cycled,† but that it goes over, probably, to some grass host to complete its life-cycle, and that in the spring it jumps again from the grass by means of the basidiospores back to the cotton.

* Bull. 226, Bureau Plant Industry, p. 56.

† Dr. Arthur has reached the same conclusion, as stated in his letter of August 16, as he succeeded in germinating the cotton rust spores in a manner to show their aecial nature.

The hypothesis is for the present quite satisfactory that the cotton rust in this one locality was virulently epidemic this past spring (in April (?), May and June), on account of unusually favorable weather conditions which must have prevailed at the time. After the cool winter, the teleutospores on the enigmatical alternate grass host, germinating in the favorable rains and dews of April and May, would scatter by means of the prevalent winds an abundance of infection over to the cotton. The restricted nature of the epidemic argues either that the infection of the grass host carrying the alternate stage must have been itself quite restricted or else that the weather conditions in the one locality only, in the vicinity of Mission, must have been especially favorable for the spread of the disease.

It seems quite likely that the rust occurs sporadically every season, in perhaps many localities. Records show that it has

FIG. 11. *Cycas circinalis,* presented to the Garden on April 1, by Mr. Harold I. Pratt. Photo June 27, 1917. (Neg. 2211.)

occurred in California, Lower California, Mexico, Falfurrias, Texas, and Miami, Florida. Apparently only in exceptionally favorable circumstances, as in the present case, does it become epidemic and therefore of economic importance.

E. W. Olive.

NATIONAL RESEARCH COUNCIL.

As is now well known, the National Academy of Sciences, at the request of the President of the United States, has appointed a National Research Council to assist and encourage scientific research. With this end in view, the council is collecting information concerning the research men and facilities available in the United States. Such information will be used to promote research in pure science, to stimulate investigational activity and cooperation along technical lines, and to aid in the solution of the scientific and technical problems of the government, with particular reference to national defense. The chairman of the council is Professor George E. Hale.

Blanks have been distributed to the scientific and higher educational institutions of the country, asking them to appoint research committees to report on any research funds, and to indicate in what ways and to what extent, in view of existing war conditions, the men and facilities of the institution are available for problems relating to national defense. The research committee of the Brooklyn Botanic Garden is composed of Dr. E. W. Olive (chairman), Dr. O. E. White, and the director of the Garden.

A second blank for "Departmental Report" has been distributed, calling for fuller information as to research work now in progress, names and ages of investigators, the percentage of their time now devoted to research, their main line of research, and the percentage of their time that could be made available for national defense problems. Information is also requested concerning special research equipment and facilities, the greatest research needs of the staff, the suggestion of research problems in pure science and directly for national defense, and the names of outside institutions with which staff members are now cooperating.

With reference to the last question, it may be here noted for the information of the members and friends of the Garden that Dr. Olive is a collaborator in plant disease work, and Dr. O. E. White in plant breeding, with the Bureau of Plant Industry, of the U. S. Department of Agriculture. In this connection, Dr. Olive has, among other activities, made a trip to the Mexican border (see pp. 154–158 of this issue) to make a survey of

FIG. 12. *Cycas circinalis.* Near view of plant shown in Fig. 11. The terminal staminate, or "male," cone measured 24 inches from tip to stalk. Photo June 28, 1917. (Neg. 2210.) Cf. Fig. 13.

the nature and extent of the cotton rust, which has been causing considerable injury during the past season. Interesting specimens of diseased cotton plants were collected by Dr. Olive on this trip and will be added to our cryptogamic herbarium.

The botanists of the country may render invaluable services in connection with national defense, directly and indirectly, and it has been a pleasure to offer to the National Research Council, all the equipment and facilities of the Brooklyn Botanic Garden, so far as they can be utilized to advantage.

CHILDREN'S GARDEN EXHIBIT

The fourth annual children's garden exhibit was held at the Brooklyn Botanic Garden on September 14 and 15. The products came in Thursday afternoon and Friday morning. The exhibit was held this year in a new range of greenhouses which is to be the permanent home of the indoor classes for children and teachers. The impression of the exhibit after placing, was this, that war garden products were predominant, for flowers were few in number and potatoes, beans, tomatoes, and other vegetables were greatly in evidence. There were no entries at all in some of the flower classes, while even the school displays showed excellent vegetables.

The judges were Mr. J. Harrison Dick, editor of the Florists' Exchange, Mrs. Louis Levy, of the Board of Education, New York City, and Mr. Benjamin Hammond, of Beacon, N. Y., chairman of The Children's Garden Committee, Society of American Florists.

This year a new trophy was offered to take the place of the old one which was won by P. S. 152. This trophy is a bronze tablet bearing a bas relief of our own children's garden. P. S. 98 won this. Second prize in Class A, a silver cup, was won by P. S. 89. A new class for roof gardens had for a trophy, a bronze of the winged Victory. This was won by P. S. 43. In the box display P. S. 49 won first prize, a silver cup; and P. S. 43 second prize, a silver cup.

NOTES

The Torrey Botanical Club has issued announcements of exercises to be held on October 18–20, 1917, in celebration of the fiftieth anniversary of the foundation of the Club. The exercises on the eighteenth are announced to be held at Columbia University, under the auspices of the department of botany; those on the nineteenth at the Lorillard Mansion, New York Botanical Garden; and those of Saturday, the twentieth, at the Brooklyn Botanic Garden, at 2 p. m. The following committee is in charge: N. L. Britton, chairman, C. S. Gager, R. A. Harper, M. A. Howe, H. M. Richards.

On July 27, Dr. C. D. Jarvis, special collaborator of the U. S. Bureau of Education, Washington, D. C., who is conducting the course in children's gardening at Teachers' College, Columbia University, during the summer session, addressed our summer school class for teachers of children's gardening. Dr. Jarvis took as his subject the "Theory of Children's Garden Work, and the Way the Bureau of Education is Meeting this Problem."

On July 31, Dr. Jean Broadhurst, of Teachers' College, spoke to our summer class on "Bacteria and their Relation to Canning." After the lecture there was an informal reception to Dr. Broadhurst. Members of Dr. Broadhurst's own class at Columbia met here at 4:00 o'clock to inspect our children's gardens and visit the Japanese and rock gardens.

The Flatbush Garden League had a demonstration in canning at the Botanic Garden on July 27. Modern methods of canning were taken up and demonstrated. The vegetables canned were raised in the garden of the Flatbush Garden League. This garden was started on our grounds by the League as a part of their short course in gardening given them at the Botanic Garden this spring. The demonstrator of canning, Miss Mary Barber, was sent by the New York Food Aid Committee. The demonstration was open to the public and about fifty people attended.

The students who are taking the regular year's course for garden teachers this year have not only maintained their practice gardens here on our grounds, having supervision over 350 plots, but have also taken over the summer care of gardens at three public schools in Brooklyn. Two young women have been twice a week all summer to the garden connected with Public School No. 82; two others to Public School No. 24; and still two others have taken charge of a small garden at Public School No. 22. Every Friday afternoon the students have spent their time in home garden visiting. We have under our charge about 200 home gardens this year. These gardens are visited three times throughout the season by the students, the first time in company with the assistant curator of elementary instruction, Miss Cross.

Twenty-two students were registered in our summer course for garden teachers. These students represent, for the most part, teachers in the elementary schools of Brooklyn. One of the students, sent by Bryn Mawr College, is to be the future nature study teacher in the out-door model school connected with that College.

During one week in July, there was taken from the main children's gardens, which include 264 plots each 6×8 feet, $190 worth of crops. This is an average of what would be taken out of these gardens weekly for several weeks during the summer.

It was announced in the spring that the *Bulletin of Miscellaneous Information* (Kew), popularly known as the "Kew Bulletin," would suspend publication for the alleged reason of shortage of paper. Commenting on this the English weekly, *Nature*, said: "When we see the waste of paper used in Parliamentary Reports, National Service propaganda, and by government departments generally, and place this by the side of the amount required for the continued publication of such a periodical as the *Kew Bulletin*—imperial in its scope and influence—we begin to despair that our state officials will ever possess true standards of value in matters pertaining to science." It is a pleasure to note that the action originally contemplated has been reconsidered and

the *Bulletin* will be continued, according to a statement of Mr. Stanley Baldwin, made in the House of Commons. The Select Committee on Publications and Debates' Reports have recommended that the *Bulletin* be continued, but on a more economical basis.

The Report of the New York Agricultural Experiment Station (Geneva) for 1916, part two, is an imposing volume of 541 pages and 94 illustrations, including a frontispiece portrait of Andrew Jackson Downing, a noted early American horticulturist, a map showing the peach regions of New York State, and many beautiful colored illustrations of fruit, foliage, and blossoms. The book contains a wealth of historical, botanical, and horticultural information concerning the peach. Among other things the author reviews the various lines of evidence that the peach did not come originally from Persia, although that fallacy persisted in all horticultural and botanical literature for 2,000 years.

FIG. 13. *Macrozamia spiralis,* received from Australia Feb. 16, 1915. Note the lateral carpellate, or "female," cones. (Neg. 2314.) Cf. Fig. 12.

The evidence is also given that the peach is a native of China. This evidence was apparently clinched by Mr. Frank N. Meyer, agricultural explorer of the U. S. Department of Agriculture, who, in 1916, discovered the "real wild peach" growing in loess ravines near the village of Tchaoyu, China. The volume is uniform with several preceding ones on the cherries, grapes, plums, apples, and other fruits that may be successfully grown in New York State.

Cycads in Bloom.—In a valued gift of forty or fifty plants, presented by Mr. Harold I. Pratt on April 12, was a carpellate, or male, specimen of *Cycas circinalis*. During June this plant produced a beautiful cone of pollen-bearing carpels. The cone measured two feet in length from the tip to the stalk. As may easily be seen from the illustrations (figs. 11 and 12), the cone in this species of Cycad is terminal, not borne in the axil of a leaf. The pistillate, or female, cone of the species is likewise terminal. This plant is now (August 20) producing a new crown of leaves.

In figure 13 is shown one of the cycads (*Macrozamia spiralis*), obtained in February, 1915, from Australia. This is a female plant, and shows that in this species the carpellate, or seed-bearing, cones are borne laterally in the axils of the leaves. Other illustrations of the cycads from Australia were shown in the RECORD for July, 1915.

The Boston Mycological Club, having a membership of about 140, has recently issued a printed announcement of its aims and activities, from which the following statements are quoted. "This Club has for its object the study of mushrooms, for their scientific interest, for their beauty and for their attractive qualities as food. Through the summer and autumn the club has an exhibition of mushrooms once a week, at which a number of members come together to compare and identify their fresh collections. Fifty to a hundred different kinds are sometimes exhibited. The exhibitions are open to the public and offer an excellent opportunity to begin an acquaintance with mushrooms. The Club has a large collection of dried mushrooms, which are sometimes ex-

hibited in the winter, and it has a library of mushroom handbooks and journals. Mushroom suppers are sometimes held, at which there is an opportunity to enjoy the flavor of species not found in the market. The exhibitions of 1917 began on Monday, July 9, and continue every Monday from 12 to 3 o'clock, until about November 1, at Horticultural Hall. The public is invited to attend and bring mushrooms for identification." Here would seem to be a fruitful suggestion for the department of botany of the Brooklyn Institute. The Botanic Garden will be glad to offer its rooms for exhibition purposes as well as the full facilities of its library and herbarium.

School Gardens in India.—In the RECORD for January, 1913, attention was called to *Teachers Leaflets,* issued by the school garden department of the Royal Botanic Gardens, Ceylon, giving information concerning school gardens in that island, where there existed, in 1910–11, nearly 250 of these gardens. There has recently come to the Garden library *Bulletin 34, Agricultural Educational Series,* of the Department of Land Records and Agriculture, of the United Provinces of Agra and Oudh, entitled "A Brochure on School Gardens," by H. J. Davis, superintendent, Government Horticultural Gardens, Lucknow. Although dated 1915, the *Bulletin* has just come to hand. The author refers to school gardens as "an essential feature in the daily life of a child." Information of value to garden teachers in India is given concerning the educational purpose and the conduct of children's gardens. It is interesting to note that practically every one of the 48 flowers, concerning the planting and care of which information is given, are the species and varieties most familiar to the children in our own school gardens.

The following letter dated September 14, 1917, speaks for itself: "My dear Miss Shaw: I wish to express my great appreciation of your assistance with our school garden. . . . Our little farmers have developed a real taste for hard, healthy work, and a true love for plant life. The garden was a much greater success than I anticipated, all due to your kind cooperation. With best wishes and many thanks for your consideration, I am Yours Sincerely, (Signed) Augusta D. Moore, Principal" (Public School No. 24, Brooklyn).

Two of the boys who have taken work consecutively for the past three years in the conservatory and garden classes of the department of public instruction have recently been placed in gardening positions by the curator; one boy with a local florist, the other with Mr. John Lewis Childs, at Floral Park, L. I. The first boy refused an offer of a clerical position paying seven dollars a week more than he receives from the florist. A number of boys who have found their chief life interests in our work for older boys and girls are planning to continue it in an agricultural school or college.

Registration for plots in our children's gardens for 1918 are already being received; the first were by two high school boys, on September 20.

On September 19, Public School 36 presented a mission seat for our children's room. The seat was made entirely by three boys of the school in their manual training class. The acting principal of the school is Miss Johanna Becker, who completed our course for teachers of gardening in 1915. The gift was most timely and very greatly appreciated.

Mr. G. H. Pring, in charge of conservatories, Missouri Botanical Garden, St. Louis, was a caller at our Garden on September 14.

Among rare plants in bloom in our conservatories during September was the orchid, *Stenoglottis longifolius*. The specimen was received last spring from Mr. Harold I. Pratt.

The Garden library has recently secured by purchase a steel engraving of Sir W. J. Hooker, the first director of Kew Gardens, England. The engraving is by H. Cook from the painted portrait by T. Phillips, R.A., and was published by Fisher Son & Co., London, 1834. Accompanying the portrait are five autograph letters of W. J. Hooker, and one of his illustrious son, Sir Joseph D. Hooker, the second director of Kew.

In the Garden *Leaflet* for September 12, 1917, eighteen talks were listed for Grades 4A–7B of the public schools. The attendance to each of these is limited to 100 pupils so that each pupil may be given more individual attention at the demonstrations that follow the talk. While this arbitrarily reduces the attendance figures, it affords immeasurably greater educational advantage. The value placed upon this work by the schools is evidenced by the fact that by September 28, requests for talks had been received from more classes than could possibly be accommodated, every available period being assigned for October and November. Much to our regret we have been obliged to decline every request received since the above date.

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